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iQ[®]₂₀₀ Sprint[™]

Service Manual



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1. Introduction

Intended Use

This Service Manual is intended for the *iQ*₂₀₀ Sprint and the *iQ*₂₀₀ 2nd generation Automated Urine Microscopy Analyzer – HVL (High Volume Laboratory).

There are two HVL configurations:

- The *iQ*₂₀₀ Sprint can process 101 samples per hour
- The *iQ*₂₀₀ 2nd generation can process 60 samples per hour

These instruments have a new fluidic design, the capability of connecting Load and Unload stations, and improved error reporting.

The *iQ*₂₀₀ Sprint™ Automated Urinalysis System (*iQ*₂₀₀ System) is an ***in-vitro* diagnostic use device** composed of the *iQ*₂₀₀ Automated Urine Microscopy Analyzer (*iQ*₂₀₀), connected physically and electronically to the AUTION MAX™ AX-4280 Automated Urine Chemistry Analyzer (AX-4280), and a workstation. The *iQ*₂₀₀ System is used to automate the complete routine urinalysis profile, including urine test strip chemistry panel, specific gravity, color, clarity, and microscopic analysis, providing quantitative or qualitative counts of formed elements, such as cells, casts, crystals, and organisms.

Optionally, the *iQ*₂₀₀ Automated Urine Microscopy Analyzer can be used as a stand-alone device for microscopic analysis, and the results from the *iQ*₂₀₀ can be combined with other urine chemistry results.

This manual is intended to be used by Iris Diagnostics trained personnel.

How to use this Manual

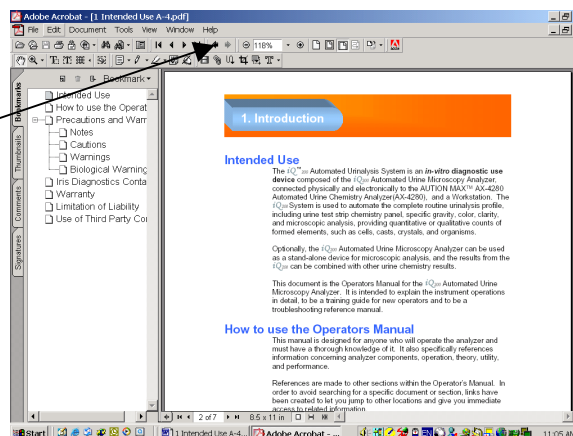
References are made to other sections within the Manual. In order to avoid searching for a specific document or section, electronic hyperlinks have been created to let you jump to other locations and to give you immediate access to related information.



1. Introduction

To follow a link:

1. Select the hand tool 
2. Links are indicated in the following manner:
 - The text is colored blue and underlined. Example: [Iris Diagnostics Contact Information](#).
3. Position the pointer over the linked area on the page until the pointer changes to the hand with a pointing finger . Then click the link.
4. To return to the previous section, click on the Go to Previous View button.
5. The Bookmark pane, located on the left side of the screen, can be used as a “linked” table of contents. Click on the + or - sign located next to the title to expand or collapse the selection for a bookmark. Clicking on a bookmark will take you automatically to the starting page of the selected section.



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1. Introduction

Precautions and Warnings

The Manual includes information and warnings that must be observed by the operator to ensure safe operation of the system. Important messages are highlighted with borders and special icons identifying the type of message enclosed.

There are four types of messages.

Notes



NOTE: Highlights important facts, gives helpful information and tips, and clarifies procedures.

Cautions



CAUTION: Electrical caution! Unplug before handling.



CAUTION: If any liquid is spilled onto the Sampler, wipe the area clean before testing. Leaving the spill may cause crystals to form and block the movement of the sample racks.

Warnings



WARNING: Identifies potentially hazardous situations that could result in serious injury to laboratory personnel.

Biological Warning



WARNING: Wear protective gloves to prevent exposure to pathogens. Discard contaminated materials according to applicable regulations.



1. Introduction

Warranty

Iris Diagnostics, a subsidiary of Iris International, (Iris) warrants that the products manufactured by it, its divisions or subsidiaries and sold hereunder shall be free from defects in material and/or workmanship, under normal use and service, for the period expiring twelve (12) months from the completion of installation under standard procedure by Iris Diagnostics or an authorized Iris Diagnostics distributor, or upon Purchaser's signature on Iris Warranty/Acceptance form, or eighteen (18) months from shipment, whichever occurs first. Iris Diagnostics makes no warranty whatsoever regarding products manufactured by persons other than Iris Diagnostics, its Divisions or Subsidiaries and Purchaser's sole source of warranty therefore, if any, is the original manufacturer's warranty.

No warranty extended by Iris Diagnostics shall apply to any products which have been modified, altered, or repaired by persons others than those authorized or approved by Iris or to products sold as "used."

Iris Diagnostics' obligation under this warranty is limited SOLELY to the repair or replacement, at Iris Diagnostics' option, of defective parts, F.O.B. warehouse or local Iris office, or as otherwise specified by Iris. Repairs or replacement deliveries shall not interrupt or prolong the term of this warranty. Iris Diagnostics warranty does not apply to consumable materials, except as specially stated in writing, not to products or parts thereof manufactured by Purchaser.

This limited warranty is made on condition that immediate written notice of any defect be given to Iris Diagnostics and that Iris inspection reveals that the Purchaser's claim is valid under the terms of this warranty.

Iris Diagnostics makes no warranty other than the one set forth herein or that which may be provided in a separate warranty covering the applicable product category. Such limited warranty is in lieu of all other warranties, expressed or implied, including but not limited to any expressed or implied warranty of merchantability or fitness for particular purposes and such constitutes the only warranty made with respect to the products.



Iris Diagnostics, a Division of Iris International, Inc.

1. Introduction

Limitation of Liability

Iris Diagnostics shall not be liable for any loss of use, revenue or anticipated profits, or for any consequential or incidental damages resulting from the sale or use of the products.

Use of Third Party Computer Products

Iris Diagnostics does not recommend that the workstation provided as a functional part of the *iQ²⁰⁰* Automated Urine Microscopy Analyzer or the *iQ²⁰⁰* System be employed for performing any software or hardware-based applications other than those specifically furnished to operate and support the Iris instrument system, or those recommended and offered by Iris Diagnostics specifically as accessories or enhancements for the Iris instrument system. No other third party application software should be installed in these microcomputers in addition to those provided or recommended by Iris Diagnostics, without the expressed approval of Iris Diagnostics Technical Services, in order to avoid potential performance and reliability problems which can result from incompatibility factors, errors in use of such software, or software-based "viruses."

Installation of such third party software, or non-approved electronic cards or other devices, without advance Iris Diagnostics approval may affect the terms of or void any Iris Diagnostics warranty otherwise in effect, covering Iris Diagnostics supplied software and hardware on the microcomputers and the overall performance and reliability of the entire Iris Diagnostics instrument system.



1. Introduction

Iris Diagnostics Contact Information

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iQ²⁰⁰ Sprint™ (2G) Automated Urine Microscopy Analyzer Service Manual 300-4949 Rev A 01/2005 1-7

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2. Installation Procedures

Installation Requirements

Space Requirements

The *iQ*[®]₂₀₀ is a tabletop unit requiring free space on a standard (36 inch: 0.9m) height countertop of approximately 36 inches wide by 24 inches deep (91cm by 61cm), with vertical clearance of at least 24 inches (61cm).

With optional Load and Unload stations, the width requirement is 60 inches (147 cm.)

Workstation

The Workstation is composed of a desktop computer, video monitor, keyboard and mouse requiring a suitable counter or desktop, providing comfortable access and a good viewing angle. It is suggested that, if possible, the WorkStation be placed in a work area, which can be semi-darkened to increase screen display visibility and reduce glare.

The data connections are made between the *iQ*[®]₂₀₀ and the Workstation (and the AX-4280 and the WorkStation, if applicable) via the special cables provided.

Location

For most laboratories, the *iQ*[®]₂₀₀ is placed near an open benchtop work area which can be used for preparation of urine tubes and sample racks. All data transmissions from the *iQ*[®]₂₀₀ (and the Ax-4280, if used) are routed to the Workstation, which manages and controls all communications to the Laboratory Information System (LIS) via serial connections.

Requirements

The *iQ*[®]₂₀₀ uses 90 to 240V AC, 50-60Hz input source. Neither voltage nor frequency parameters are customer configurable. Uninterruptible power supplies are recommended and available from Iris Diagnostics for the *iQ*[®]₂₀₀ and the Workstation (and the AX-4280 if applicable) to maintain system operation during short power outages and brownouts. This allows for an orderly shutdown of instruments without the loss of data.

Installation

The *iQ*[®]₂₀₀ will be installed by a factory-trained representative from Iris Diagnostics.



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2. Installation Procedures

Shipping Cartons

The *iQ*₂₀₀ is shipped in three cartons.

Instrument Carton

Item number	Description	Qty
800-3320 800-3322	<i>iQ</i> ₂₀₀ 60/hour or <i>iQ</i> ₂₀₀ <i>Sprint</i> [™] 101/hour	1
700-3103	Printer	1
250-3082	Printer Cable	1
700-3120	Computer Version 3.0	1
210-3004	Flat Panel Monitor	1
700-3101	Keyboard and Mouse	1
700-3022	Sample Racks (1 Set of 9)	1
700-3008	Calibrator Rack	1
700-3007	Control/Focus Rack	1
700-3781	iQ Lamina Cap & Filter	1
700-3701	Drain Tubing	1
700-3702	Lamina Tubing	1
250-3501	Serial Cable, PC to Microscopy Module	1
700-3011	Operators Manual CD	1



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2. Installation Procedures

Starter Kit A Carton

Item number	Description	Qty
475-0047	iQ [®] ₂₀₀ Lamina	1
475-0021	Iris Diluent	1
475-0003	Iris System Cleanser	1
660-0036	Culture Tube, 16x100 250 pack	1
800-3211	iQ [®] ₂₀₀ Dilution Labels Package	1

Starter Kit B Carton (needs refrigeration)

Item number	Description	Qty
800-3104	iQ [®] ₂₀₀ Control/Focus Set (four bottles)	1
800-3103	iQ [®] ₂₀₀ Calibrator (four bottles)	1

Optional

Item number	Description	Qty
800-3810	Load and Unload Set	1
800-3514	Load Station (only)	1
800-3515	Unload Station (only)	1
800-3501	Ax-4280 Bridge Connection Kit	1



2. Installation Procedures

Installation

To ensure safety, we advise you to read these installation instructions very carefully and take all proper precautions.

Precautions

The entire unit weighs approximately 140 lbs (63.5k). The Load and Unload Stations weigh 14 lbs (6.35) each. Choose a place to set up the unit before completing its assembly.

If the unit must be moved, separate the Sampler from the analyzer before moving. If these two units come apart while being carried, it may result in injury or severe damage.

Always keep a distance of at least 2 inches (5 cm) between the rear of the unit and the wall. If this distance is not maintained, the connecting tubes and cables may overheat and / or be subjected to mechanical stress.

Do NOT use power frequencies or voltage other than those specified in this document. Connection to an inappropriate power source may damage the instrument.

Make certain that the power supply for the *iQ*²⁰⁰ is from a dedicated line that provides power to no other instruments or appliances. If power is not clean and steady, a UPS and/or power conditioner is recommended.

Do NOT disassemble or modify the unit. Doing so may cause injury and/or instrument malfunction.

Place the unit on a stable and level surface free of vibration. Failure to do so may cause injury or malfunction of the unit.

Do NOT place the unit where it may be affected by chemicals, corrosive gases or electronic noise. Doing so may cause injury or malfunction of the unit.

Do NOT place the unit where it may be affected by water, direct sunlight or draft. This may yield incorrect results, and the unit may be damaged.

Select a room to set up the unit where the temperature can be controlled between 50°F (10°C) and 86°F (30°C), and humidity in a range of 20% to 80%.



2. Installation Procedures

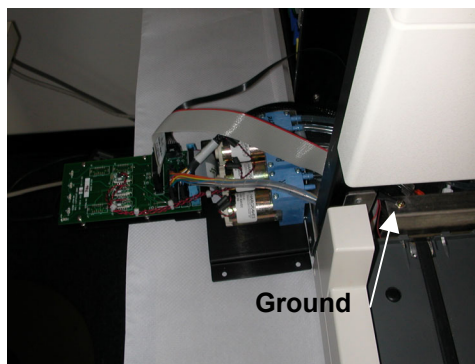
Unpacking the Instrument

Carefully remove the instrument from the shipping container. Remove all packing material from inside the instrument surrounding the SPA, the microscope and the waste well.

Connecting the Sampler

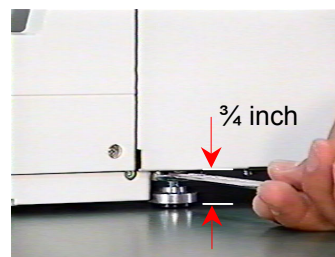
In order to protect the Analyzer and Sampler from damage during transport, each section is secured with tape. Follow the procedure below before installing the unit.

1. Remove the left side panel of the analyzer and the EMI shielding panel.
2. Remove the four screws securing the STM SIC and diaphragm pumps.
3. Connect the grey ribbon cable from the sampler to J01 on PCBA 101-5014 STM SIC.
4. Connect the multi-colored wiring cable to J02 on PCBA 101-5014 STM SIC.
5. Connect the black specimen tube detector cable to J9 on PCBA 101-5014 STM SIC.
6. Connect the ground cables to the chassis of the microscopy module.
7. Insert the hooks of the sampler into the slots of the analyzer. Be careful not to catch the cables.
8. Reattach the STM SIC and diaphragm pumps to the chassis.



Adjust the Height of the Analyzer

- Using a 7/16" wrench, loosen the locking nuts located under the analyzer.
- Adjust the height of the Sampler by rotating the feet. The space between the bench top and the analyzer must be $\frac{3}{4}$ inch.
- After adjusting the height, tighten the locking nuts.



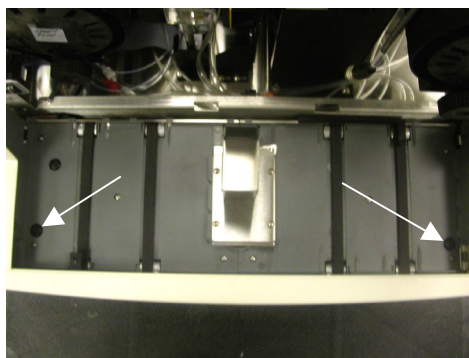
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2. Installation Procedures

Adjust Sampler

Two adjustment feet are located under the Sampler. They are accessed from the top of the Sampler. Each foot must be in contact with the benchtop.

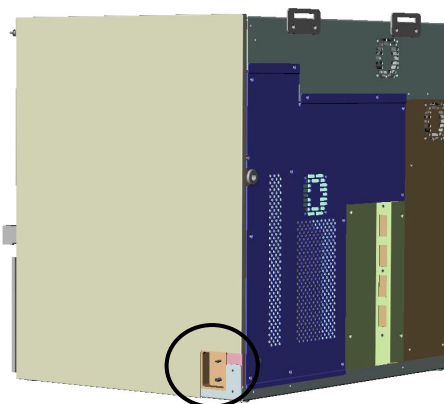
- Using a flat head screwdriver, remove the two rubber caps located on the front corners of the Sampler. The top of the feet (screws) can be seen.
- Using a Phillips screwdriver (+), turn each of the two screws clockwise until the adjustment feet touch the bench top.
- Reinsert the rubber caps.



CAUTION: Make sure the height of the Sampler is adjusted correctly. Otherwise, the Sampler and the Probe may be damaged.

Installing the Lamina Container

- Install the Lamina cap with filter on a fresh Lamina container.
- Connect one end of the Lamina tubing to the top fitting on the right side of the analyzer. Connect the other end to the fitting of the Lamina cap.



Connecting the Drain Tubing

- Connect the drain tubing to the bottom fitting on the right side of the analyzer.
- The Drain Tubing can be directed to the designated waste area according to local regulations.
- If direct drainage is not an option, slide the Drain Tubing inside a waste container (approximately 2 in. (5cm)) Make **sure the waste container is lower than the microscopy module.**



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2. Installation Procedures

Computer Connections

1. Connect the video monitor cable to the video monitor and the video port.
2. Connect the keyboard cable to the keyboard port.
3. Connect the mouse cable to the mouse port.
4. Connect the power cord into the power inlet, and then plug into an electrical outlet.
5. Connect the printer cable to the printer and the printer port.
6. Connect the 100-pin camera data cable to the frame grabber port.
7. Connect one end of the RS232 cable to the serial port on the computer; connect the other end to the serial port 1 (top port) on the back of the *iQ*²⁰⁰.



PC3 (one computer)



2. Installation Procedures

iQ200 Rear Panel SIC Connection Configurations

WARNING: Before making any connections to Load or Unload ports on the Rear Panel SIC of the iQ200, ensure the jumpers are in the correct configuration depending on the system options.

AX-4280 Connection to the iQ200

The second port labeled "Load" should have all three **jumpers removed** from the port. **CAUTION!** If the jumpers are not removed, a fuse will blow on the backplane of the card cage (F10) inside the Microscopy Module.

Load Station Connection to the iQ200

The second port labeled "Load" should have all three **jumpers installed** in the port. **CAUTION!** If the jumpers are not in place, the connection will not work and no power will be supplied to the Load Station.

Unload Station Connection to the iQ200

The third port labeled "Unload" should have all three **jumpers installed** in the port. **CAUTION!** If the jumpers are not in place, the connection will not work and no power will be supplied to the unload Station. Currently, the only configuration for this port is all three jumpers in place.

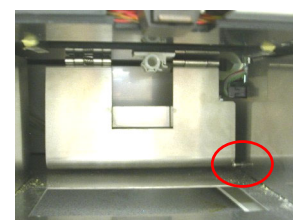
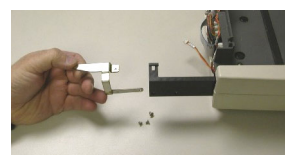
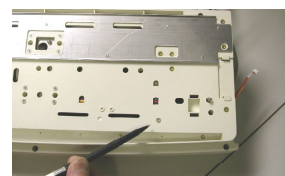
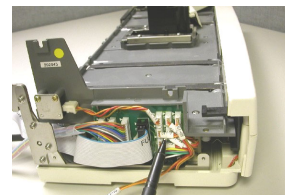


2. Installation Procedures

iQ200 / AX-4280 Bridge Installation Instructions

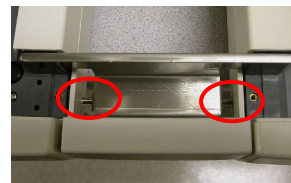
"iQ200-AX4280 Sample bridge kit" PN 800-3501.

1. Remove left side cover from the AX-4280 sampler.
2. Unplug connector # S1-10 (white label) from the circuit board and replace with connector# S1-10 (Side Sampler) stored in bottom of sampler.
3. At the bottom of the sampler, remove the screw (as indicated on the picture on the right) securing carry arm stop post. Remove the post from the sampler.
4. Extend the lever from the sampler. Attach the rack push arm to the lever with two (2, M3x5) flat head and one (1, M3x6 pan head) screws.
5. Break the tab on the side cover to allow the rack to transfer from the Load Station to the sampler.
6. Replace left side cover.
7. Back out the screw located inside the right frame of the test strip disposal compartment to hold the spring loaded return plate.
8. Install the new waste box provided with the connection kit.
9. Install an alignment bracket under each analyzer aligning the pins with the two holes located under the front of each instrument. Align the brackets and join with the connection bracket. Secure with four (4, M3x10 pan head) screws.



2. Installation Procedures

10. Install the bridge faceplate between the two samplers. Center and secure with the thumbscrews located underneath the faceplate.



11. Secure the bridge between the two samplers with two (2, M3x6 flat head) screws. Make sure the guide spring points to the left. Check for proper alignment and adjust the analyzer level and/or position to provide a smooth transition.

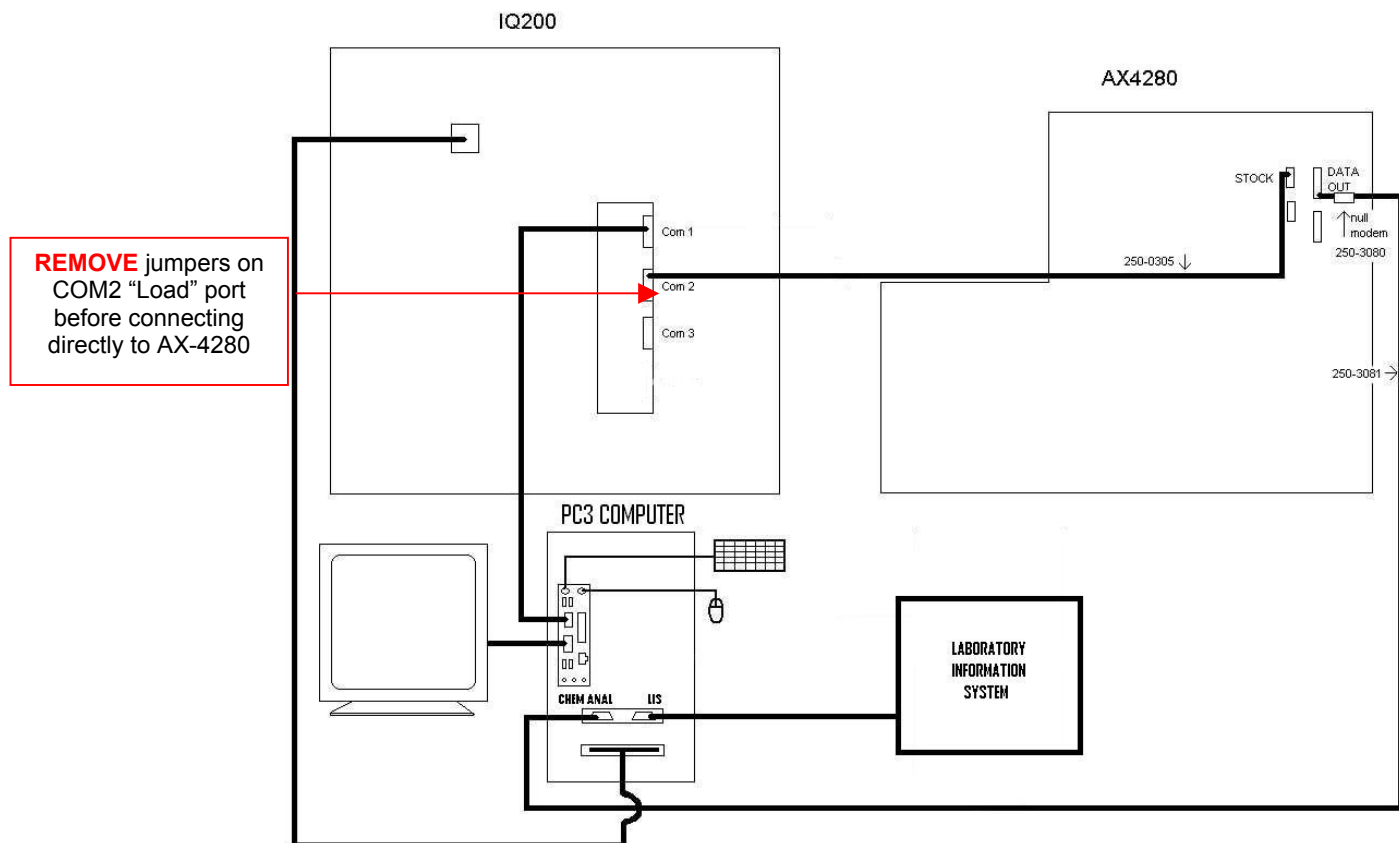


12. Make the cable connections between the analyzers, and the computer according to the layout diagram.



NOTE: Do not use the grey cable provided with the Arkray kit, the pin out for this cable will not work due to incorrect pin positioning.

2. Installation Procedures



2. Installation Procedures

13. Power up the AX-4280 while holding the STOP button to access the Service mode.
 - a. Press **-4280-**.
 - b. Press **1: "User set up"** then press **2: "User detail"**.
 - c. Press **ENTER** until **"Sampler"** is displayed.
 - d. Press the **"-"** button until **[LOWER]** is displayed and then press **ENTER**.
 - e. Save these settings when prompted.
 - f. Press **ESC** until the first menu is displayed.
 - g. Press **2: "Adjust"**. Press **2: "Pulse & LED"**. Press **1: "Pulse adjust"**.
 - h. Press the **"-"** button until **[RACK]** is displayed, then press **ENTER**.
 - i. Press the **"-"** button until **[Carry send]** is displayed. Place a rack on the left side of the AX-4280 sampler in the area where the rack can be transferred to the iQ200 from the AX-4280 and press **ENTER**. Verify that the carry arm moves the rack to the iQ sampler and is positioned on the iQ 200 sampler fully.
 - j. If the distance needs to be adjusted, change the pulse number on the AX-4280 to the proper position. A larger number carries the rack further. Use the keypad to change the value.

Press 7 to increase the pulse number by 1

Press 4 to decrease the pulse number by 1

Press 9 to increase the pulse number by 10

Press 6 to decrease the pulse number by 10

- k. Press **MENU** until the third menu is displayed.
- l. Press **2: System Option**. Press **1: Edit rack ID**.
- m. Enter the following rack ID information-

Rack numbers 1-11	Standard ID
Rack number 12	Start
Rack numbers 13-24	Standard ID
Rack numbers 25-27	Standard ID
Rack number 28	STAT/CTRL
Rack numbers 29-30	PASS
Rack number 31	NONE

14. Save these settings when prompted.

15. Return to Standby mode.



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iQ²⁰⁰ Sprint™ (2G) Automated Urine Microscopy Analyzer Service Manual 300-4949 Rev A 01/2005 2-13

2. Installation Procedures

16. Load the AX Connectivity CD PN 700-3106 on the Analysis Processor.
17. From the Main Menu screen of the iQ, click on the **Settings** button.
18. Click on **Interfaces**.
19. Verify that the “**Enable direct connection**” checkbox with the AX-4280 is selected.

The screenshot shows the 'Interfaces' configuration window. The 'LIS' section has 'Enable LIS' unchecked. Communication settings are: Bits per second: 9600, Data bits: 8, Parity: None, Stop bits: 1. Specimen information from LIS: 'Obtain specimen information from LIS' and 'Skip specimen if LIS fails' are both checked. The 'Direct Arkay AX-4280 AutionMax Connection' section has 'Enable direct connection' checked, 'Skip microscopy if no chemistry available' unchecked, and 'Gate on chemistry' checked. The 'Consolidation window' is set to 24 hours and 0 minutes. 'OK' and 'Cancel' buttons are at the bottom right.

2. Installation Procedures

20. Run a patient barcoded sample tube with diluent on the AX-4280 and verify the rack transfers to the iQ 200 without error and the chemistry results attach to the microscopy results.
21. If the chemistry results do not cross over to the worklist, check the LIS output on the AX-4280 for correct setup:
 - i. Enter **"-4280-"**
 - ii. Enter **"1"** for user setup
 - iii. Press **"MENU"**
 - iv. Press **"2"** for Online
 - v. Press **"ENTER"** until **"RS232C Normal"** is displayed
 - vi. Change "RS232C Normal" to **"ON"** by pressing **"-"**, then press **ENTER**
 - vii. Change "RS232C STAT" to **"ON"** by pressing **"-"**, then press **ENTER**
 - viii. Change "RS232C Ctrl" to **"ON"** by pressing **"-"**, then press **ENTER**
 - ix. SAVE? Yes (1) No (0) Press **"1"** to save
 - x. Press **"ESC"**, then press **"STOP"**, AX-4280 will initialize
22. If the chemistry cross over but do not attach to the microscopy, make sure the barcode reader is setup correctly and reads the label the same on both units. The label ID's should match in order to attach the chemistry and microscopy results together.



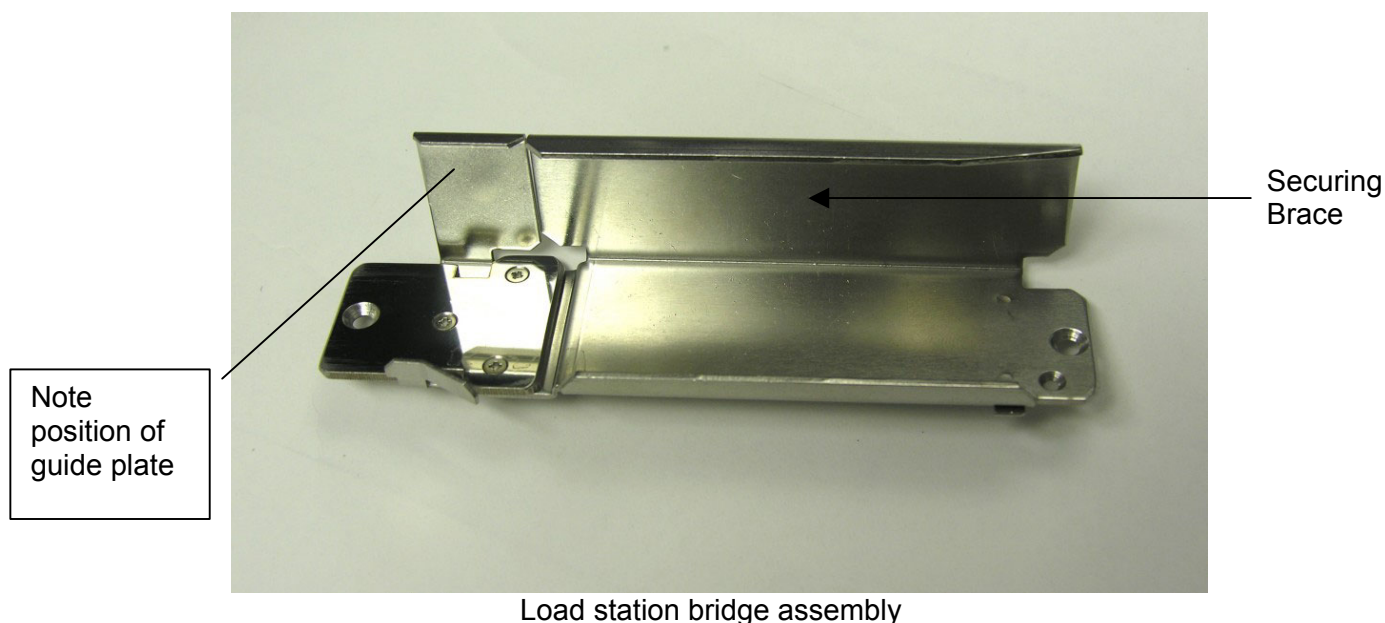
2. Installation Procedures

Optional Load/Unload Station Installation

Load Station - iQ200 Connection

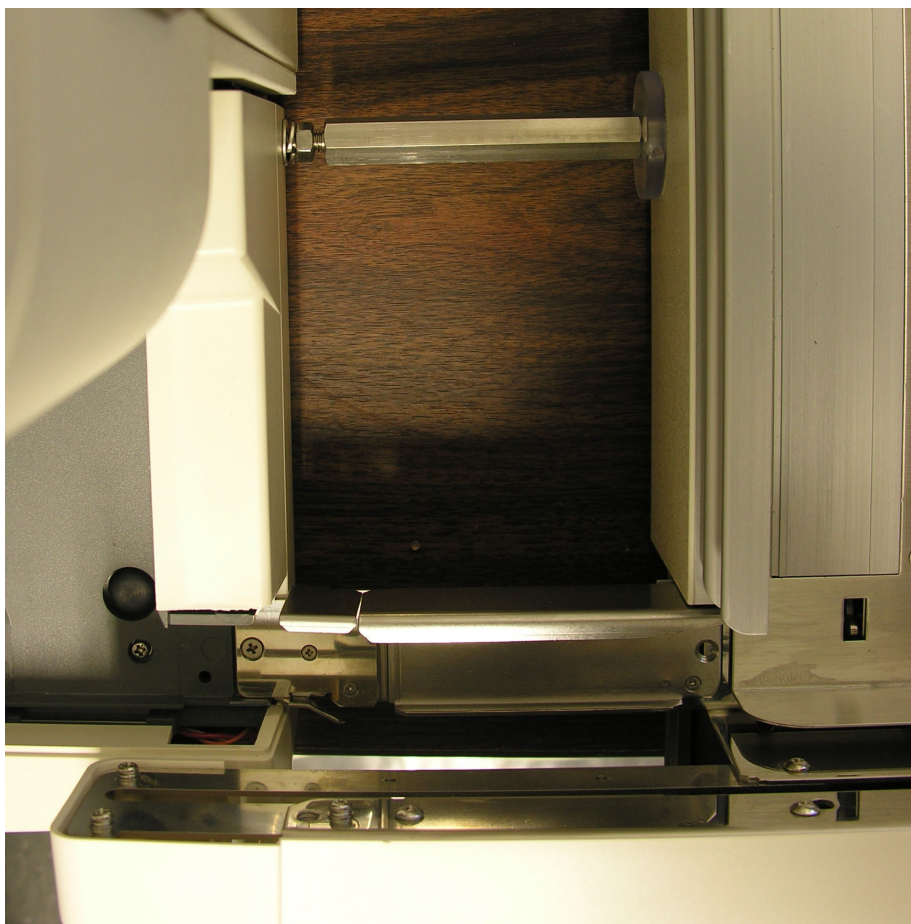
NOTE: The Load Station may be connected to either the AX-4280 or the iQ200.

1. Remove the right side cover from the iQ200 sampler.
2. Break the tab on the side cover to allow the rack to transfer from the Load Station to the Sampler.
3. Reinstall the right side cover. DO NOT install the bottom screw located on the backside of the sampler cover.
4. Assemble the bridge (see picture below)



2. Installation Procedures

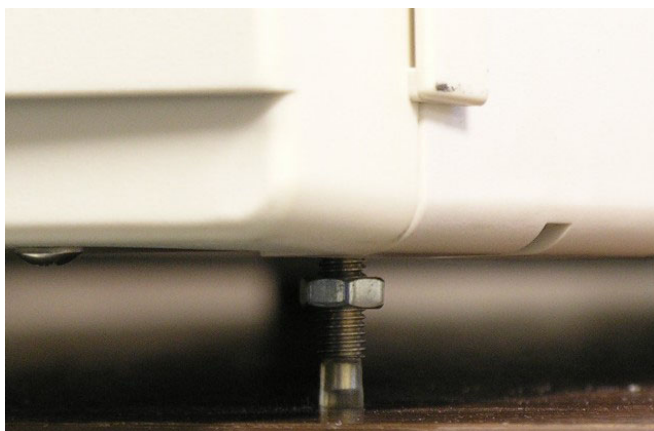
5. Connect the assembled bridge between the iQ200 sampler and the load station. (see picture below)



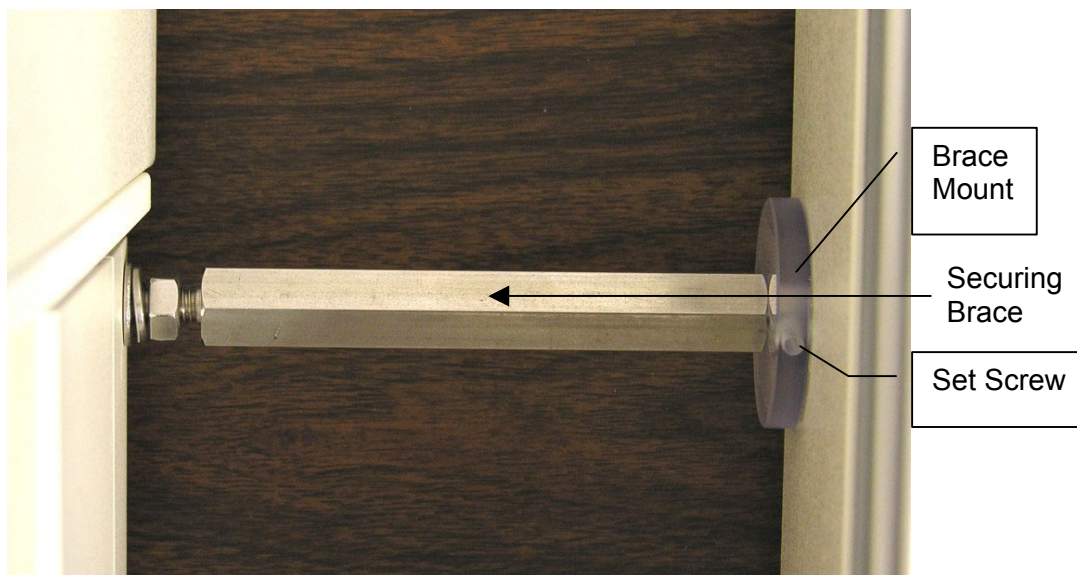
6. Attach the load station cable to port 2 labeled "Load" on the Rear Panel SIC (jumpers in.)

2. Installation Procedures

7. Adjust the leveling feet under the Load Station to assure a smooth transfer of racks.



8. Attach the securing brace to the bottom screw port on the backside of the iQ200 sampler side cover. The brace mount is attached to the Load Station with an adhesive strip. Secure the brace to the brace mount using the setscrew. (see picture below.)



2. Installation Procedures



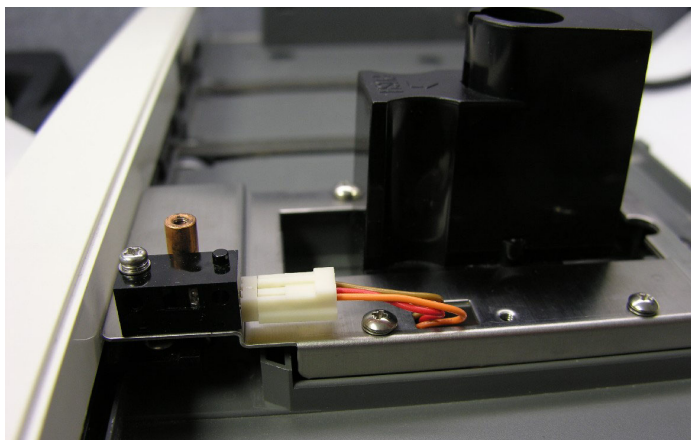
NOTE: Smooth rack transfer between stations and samplers is critical for proper operation.

9. Turn “ON” the power switch located on the back of the Load Station.

2. Installation Procedures

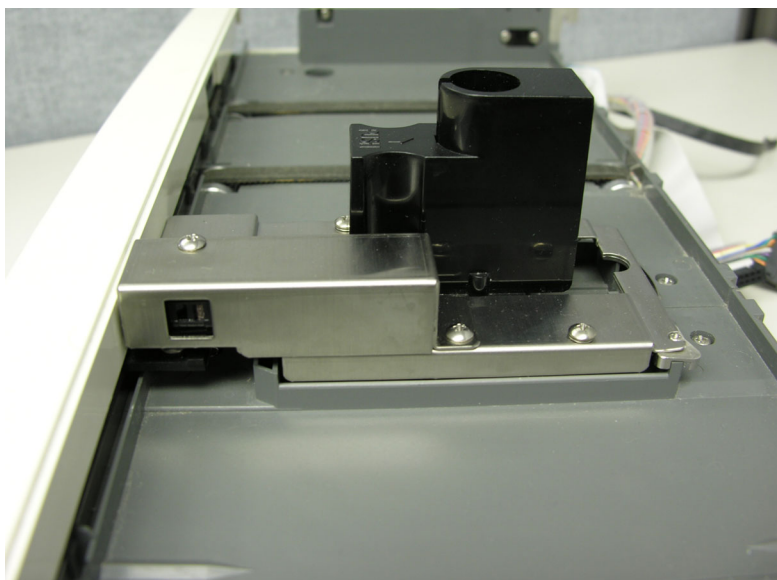
Load Station - AX-4280 Connection

1. Remove the right side cover from the AX-4280 sampler.
2. Break the tab on the side cover to allow the rack to transfer from the Load Station to the Sampler.
3. Disconnect and remove the optical sensor from the right side of the sampler.
4. Unplug connector # S2-22 (white label) from the circuit board and replace with connector# S2-22 (side sampler) stored in the bottom of the sampler. Push the sensor cable inside the sampler cover.
5. Remove the metal base plate from the STAT station.
6. Extract the sensor cable located on the right side of the STAT holder.
7. Install the new metal base plate, (included in with the load station) in the STAT station, passing the sensor cable through the hole on the right of the plate.
8. Attach the new metal base plate using the screws from the original plate.
9. Remove the black optical sensor from the mounting bracket, and connect it to the sensor cable at the STAT station.
10. Secure the black optical sensor to the side of the base plate touching the front of the sampler, using the hardware included in the bridge connection kit. (see picture below)



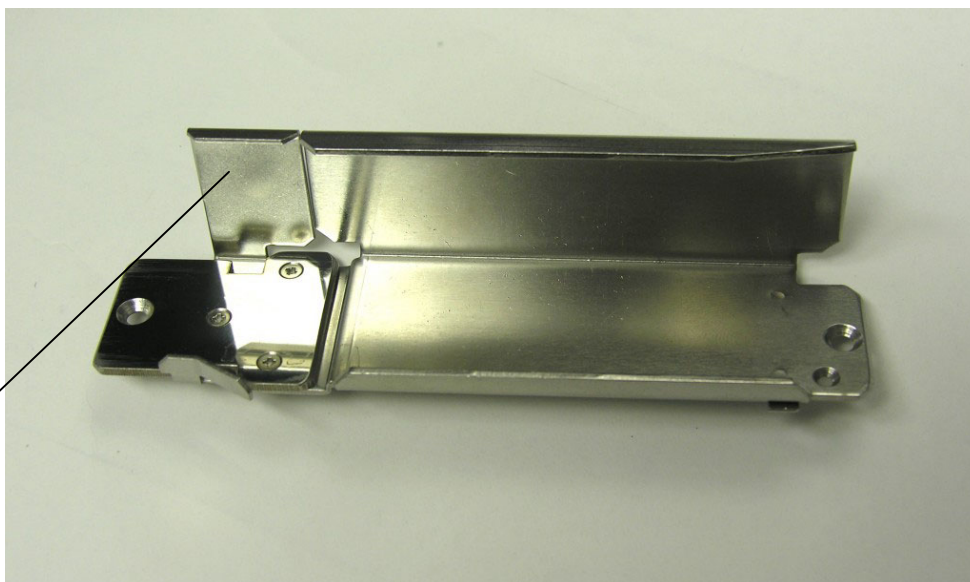
2. Installation Procedures

11. Install and secure the sensor cover to the base plate. (see picture below)



12. Reinstall the right side cover. DO NOT install the bottom screw located on the backside of the sampler cover.

13. Assemble the bridge (see picture below)

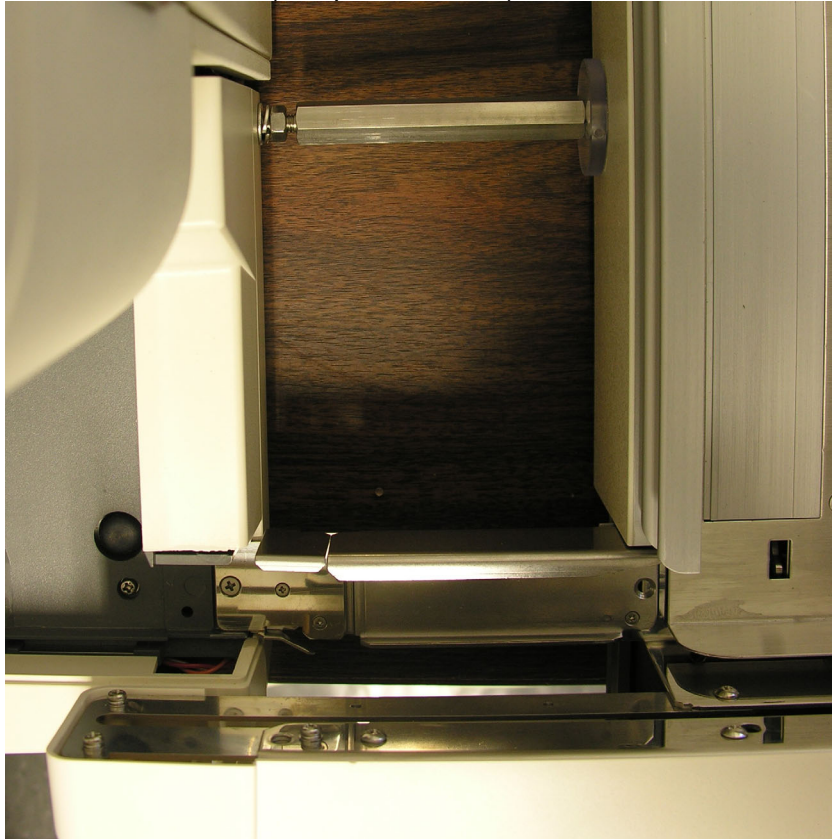


Load station bridge assembly

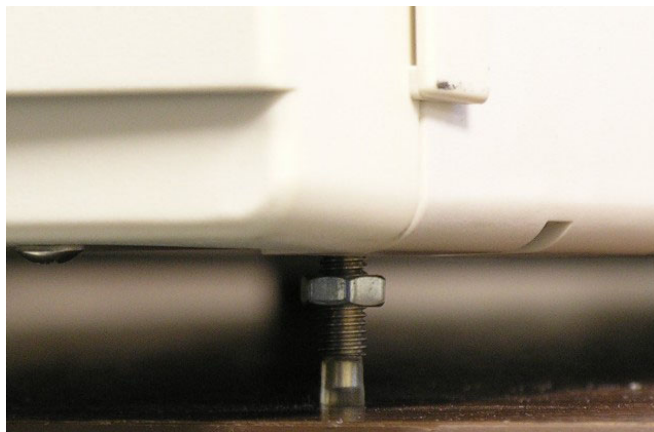


2. Installation Procedures

14. Connect the assembled bridge between the AX-4280 sampler and the load station. (see picture below)

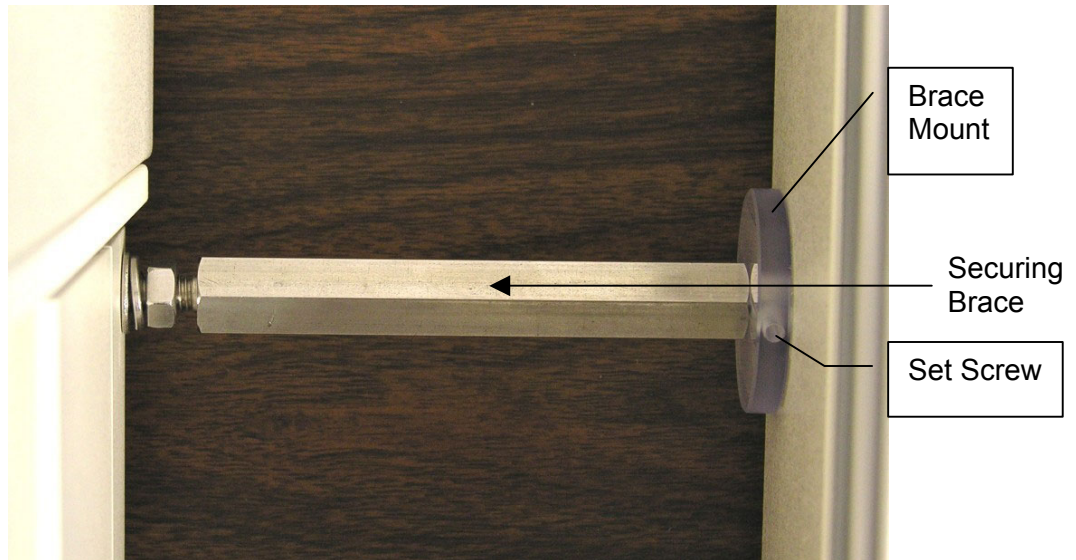


15. Adjust the leveling feet under the Load Station to assure a smooth transfer of racks.



2. Installation Procedures

16. Attach the securing brace to the bottom screw port on the backside of the AX-4280 sampler cover (see picture below.)



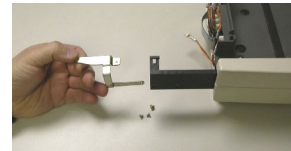
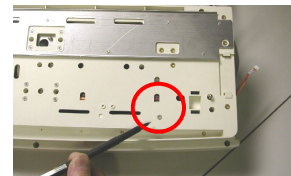
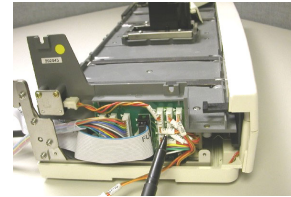
NOTE: Smooth rack transfer between stations and samplers is critical for proper operation.

17. Attach the load station cable to port labeled “Start” on the Rear Panel of the AX-4280.
18. Power up the AX-4280 while holding the STOP button to access the Service mode.
- Press **-4280-**.
 - Press **1: “User set up”** then press **2: “User detail”**.
 - Press **ENTER** until **“Sampler”** is displayed.
 - Press the **“-”** button until **[UP & LOW]** is displayed and then press **ENTER**.
19. Save these settings when prompted.
20. Turn “ON” the power switch located on the back of the Load Station.

2. Installation Procedures

Unload Station

1. Remove left side cover from the iQ200 sampler.
2. Unplug connector # S1-10 (white label) from the circuit board and replace with connector# S1-10 (side sampler) stored in the bottom of the sampler.
3. On the bottom side of the sampler, remove the screw (as indicated on the picture on the right) securing the carry arm stop post. Remove the post from the inside of the sampler.
4. Extend the lever from the sampler. Attach the rack push arm to the lever with two (2, M3x5) flat head and one (1, M3x6 pan head) screws.
5. Break the tab on the side cover to allow the lever to extend when the cover is in place.
6. Reinstall the left side sampler cover. DO NOT install the bottom screw located on the backside of the sampler cover.
7. Assemble the bridge (see picture below)

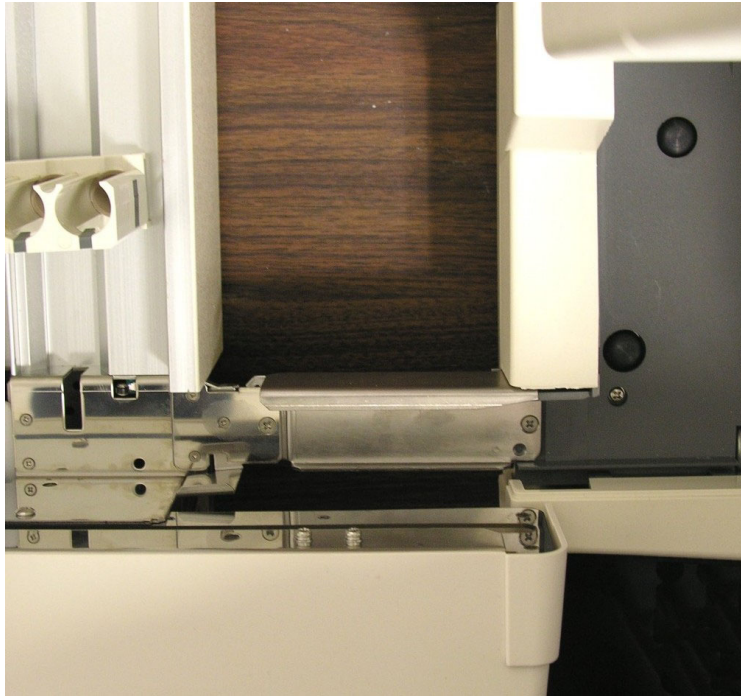


Note
position of
guide plate

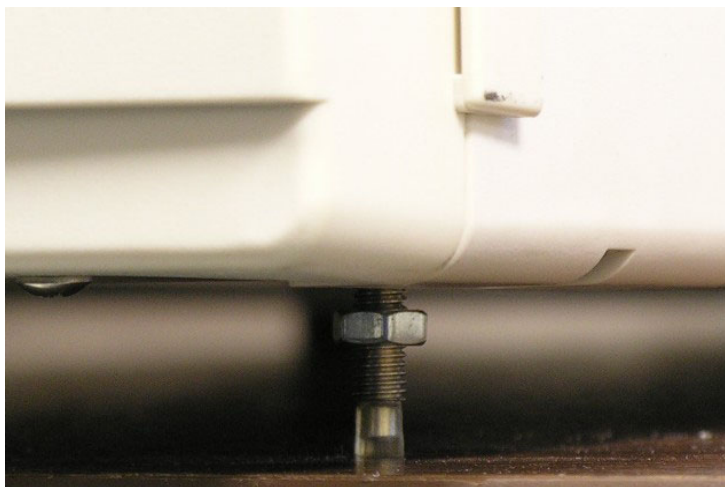
Unload station bridge assembly

2. Installation Procedures

8. Connect the assembled bridge between the iQ200 sampler and the Unload station. (see picture below)



9. Adjust the leveling feet under the Unload Station to assure a smooth transfer of racks.



2. Installation Procedures

10. Attach the securing brace to the bottom screw port on the backside of the iQ200 sampler cover. (see picture on the right)



NOTE: Smooth rack transfer between stations and samplers is critical for proper operation.

11. Attach the unload station cable to port 3 labeled "Unload" on the Rear Panel SIC (jumpers in.)
12. Turn "ON" the power switch located on the back of the Unload Station.
13. Enter the Service Application and calibrate the STM Unload station cal value **cal[3] "Distance to eject to stock yard"** so the rack transfers the correct distances onto the unload station. The rack should transfer smoothly and end up 3mm from the left side of the unload station. (See Sampler Calibration Chapter 4)



2. Installation Procedures

Startup



Note: Before power up, check inside the instrument and ensure the cables and tubing are secured and remove any packaging material.

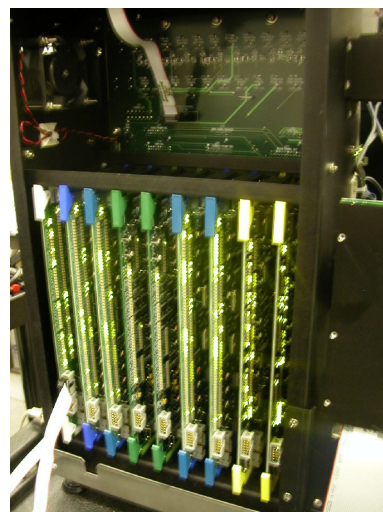
Turn on power in the following order:

1. Computer
2. Video monitor
3. Main power switch on the back of the Microscopy Module



Note: Wait until the Instrument screen is displayed. Check the status on the top left corner of the screen is “OFF”.

4. Press the green ON/OFF button on the front of the Microscopy Module
5. Press the ON/OFF button on the back of the Loading/Unloading stations.
6. Remove the panel and the EMI shielding from the left side of the Microscopy Module to access the card cage.



Note: Verify **NO** red LEDs are present on the circuit boards inside the cardcage. If red LEDs are observed, clear the fault before continuing the installation.

7. Logon to the workstation. Identifier **[IRIS]** password *iris2k1* (lowercases).



Note: Verify the Microscopy Module is in Standby mode as indicated by a status light (green) on the instrument and displayed on the top left side of the screen.

8. After startup, the Lamina tank located inside the Microscopy Module will fill automatically.
9. Place three tubes in the first three positions of the Control rack. Fill each tube with Iris Diluent.
10. Run the Control rack **twice** to prime the lines located after the Lamina tank.



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2. Installation Procedures

Run Focus

1. Place provided Focus barcode label onto a glass sample tube.
2. Place a sample tube with 6 mL of **iQ Focus** material (REF 475-0060) in position 5 of the Control rack.
3. Load the Control rack onto right side of the *iQ₂₀₀* sampler.
4. Press the **Start** on the top left side of the Microscopy Module.

Run Calibration Rack

1. Transfer 3 mL of **iQ Calibrator** into 10 round-bottom 16 x 100 mm glass test tubes.



NOTE: Do not use plastic tubes or pipetting devices.

2. Place provided barcodes on each test tube and place the test tubes into the Calibration rack (gray inserts).
3. Load the Calibration rack onto right side of the *iQ₂₀₀* sampler.
4. Press the **Start** on the top left side of the Microscopy Module.
5. Verify the Run Equivalency Factor (REF) is between 1.4 and 2.7.

Run Control Rack

1. Place provided Positive and Negative barcode labels onto glass samples tubes (one each).
2. Load the tubes into a control rack, positions 6 and 7.
3. Fill the tubes with 3 mL of control.
5. Load the Control rack onto right side of the *iQ₂₀₀* sampler.
6. Press the **Start** on the top left side of the Microscopy Module.
7. Verify the QC values are within the specifications.
8. Repeat Control rack 10 times and verify CV's of < 5% for the positive control runs.

Verify Load/Unload and Bridge Connections

1. Transfer 6 mL of Iris Diluent into five sample tubes.
2. Place one sample tube per rack at positions 1 or 10.
3. Place the five racks into the Load Station.
4. Verify that the transfer between each station and samplers are smooth and level, and that racks travel throughout the system without jam or error.



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2. Installation Procedures

Preparation for Starting Operation

Perform Setup

See Operator's Manual - Setup.



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3. Components

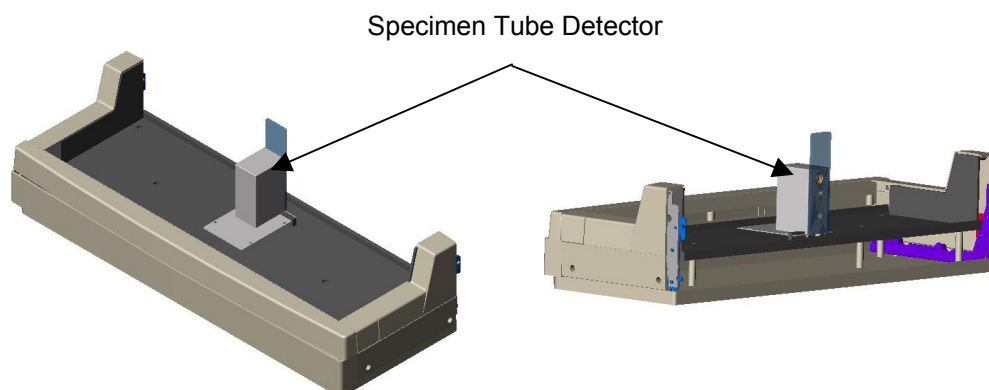
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3. Components

Sample Transport Mechanism

The Sample Transport Mechanism refers to the mechanisms associated with delivering test tubes of specimen to the Specimen Presentation Assembly. The STM is composed of the Sampler and the Specimen Tube Detector.



Sampler # 700-3006

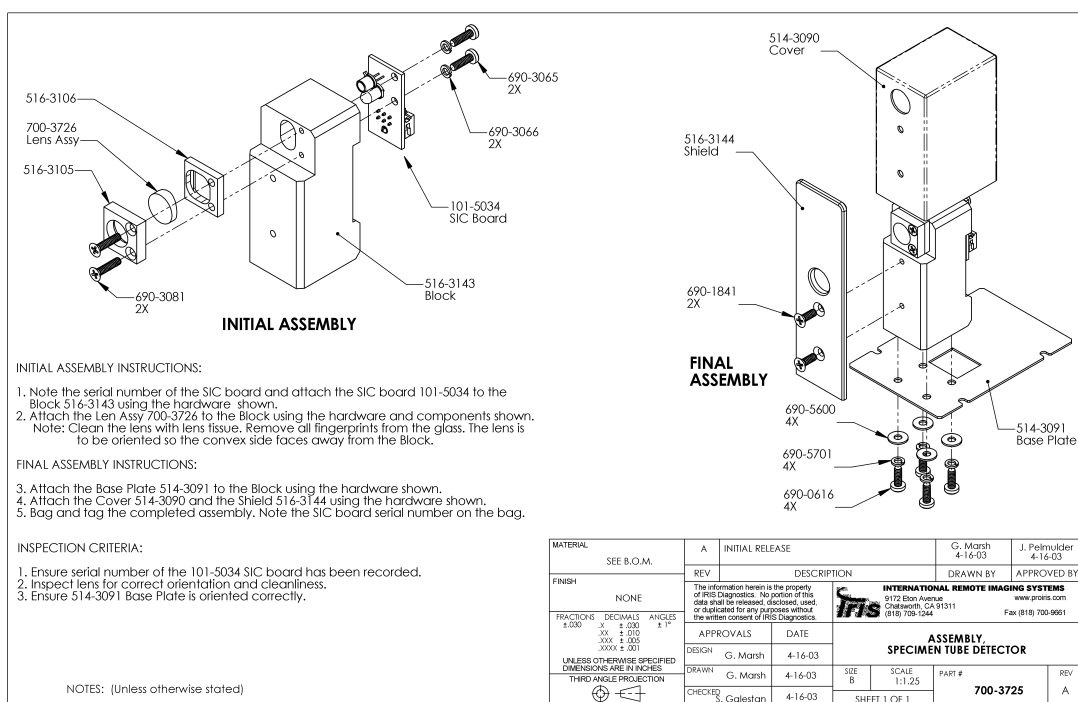
The Sampler is located on the front of the *iQ*[®]₂₀₀ and is similar to the sampler used on the AX-4280. A bridge connection can be installed between the two systems allowing automatic transfer of sample racks after they have been processed on the AX-4280.

Sample racks, each capable of holding 10 tubes, are loaded on the right side of the sampler. To start the transport of the racks to the pipetting station, the operator presses the “**Start**” button. The Sampler presents sample tubes loaded onto racks at the pipetting station. The Sampler also has electro-optical sensing of various internal (relating to motor and actuator positions) and external (relating to rack position) status. The SM was specifically designed to use the Arkray Sampler.

3. Components

Specimen Tube Detector # 700-3725

This small assembly uses specially focused visible light to determine if a sample tube is present at the position where the pipette can extract specimen. Because racks are not necessarily filled with samples tubes, the specimen tube detector allows the Microscopy Module to skip positions where there is no sample tube, avoiding using consumables for non-existent specimens, and achieving higher specimen throughput.



Component drawings may change without notice. Please contact IRIS Diagnostics to determine the current revision level.

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9172 Eton Ave
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Ph# 818-709-1244

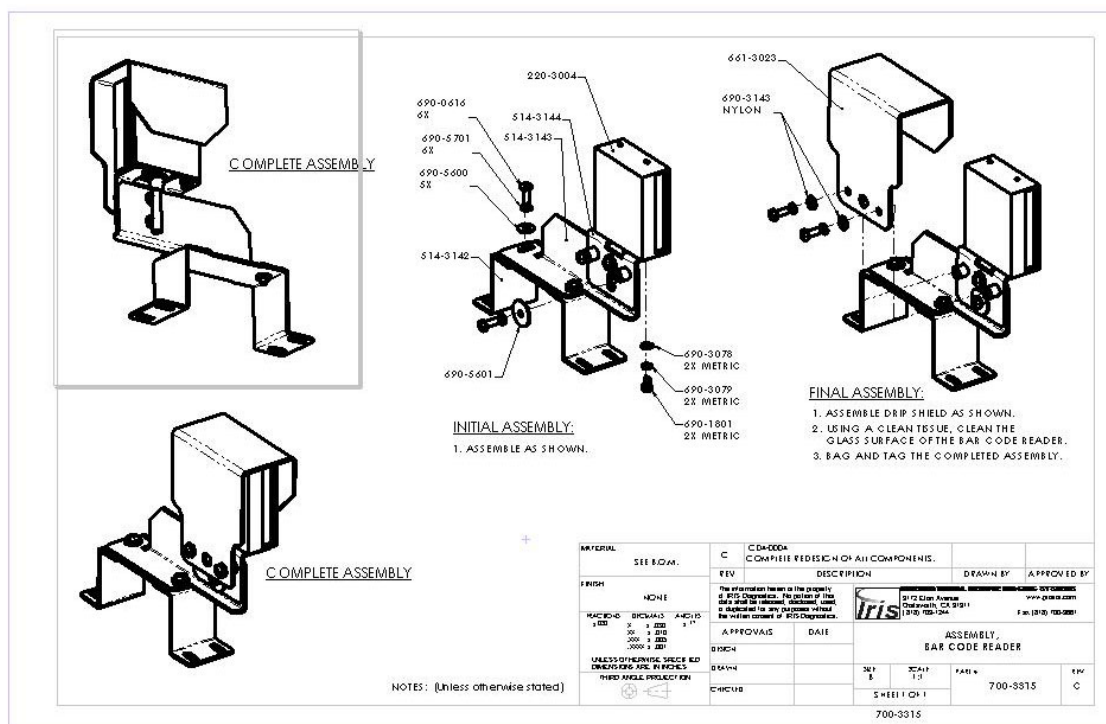
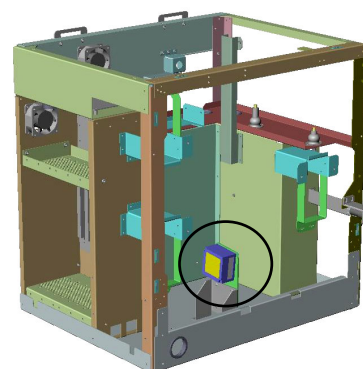


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3. Components

Barcode Reader # 700-3315

The Barcode Reader uses CCD Array optical scanning process to read barcodes.



Component drawings may change without notice. Please contact IRIS Diagnostics to determine the current revision level.

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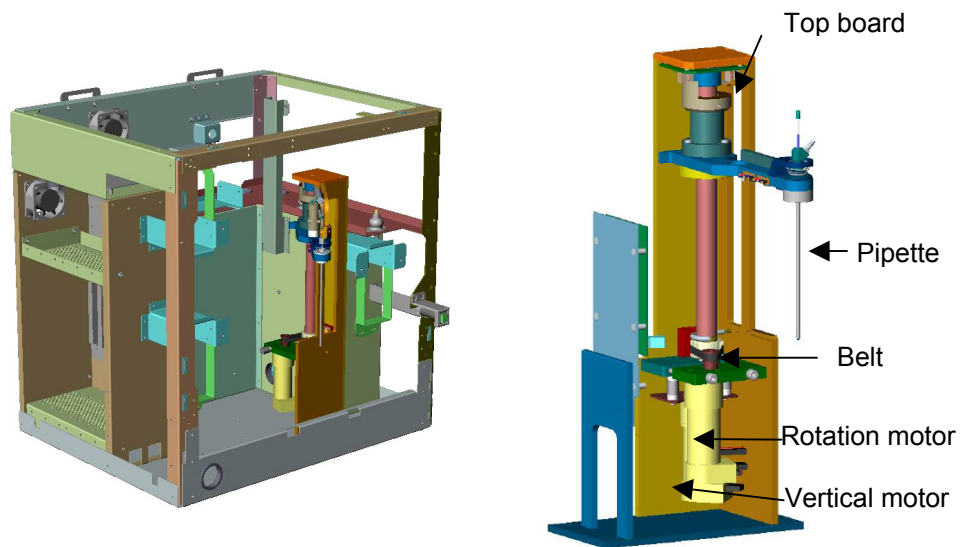


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3. Components

Specimen Presentation Assembly # 700-3700

The SPA or “Specimen Presentation Assembly,” is associated with the “front end” handling of the urine. Mechanically, the SPA mixes the specimen within the sample tube for uniform particle distribution, aspirates sample from the test tube, and delivers it to the next process in the Microscopy Module. The pipette (a vertical two-lumen tube) is mounted onto a two-axis arm, and provides the means for positioning the pipette down into the sample tube. The SPA includes two DC motors with integral encoders—one for vertical translation of the pipette arm, and one for rotation of the pipette arm.

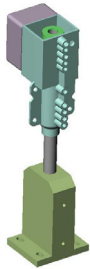


Crash Detect Function

The Crash Detect function senses one switch (of a pair of snap-action switches mounted on the SPA arm itself). A latched relay on the SPA SIC is held pulled-in until the Hard Crash switch on the SPA arm opens (due to a crash), the relay drops out, and drive to the vertical motor is interrupted. When the relay is pulled in, the green “Vert OK” LED is on. When the relay is dropped out, the red “Vert Crash” LED is on. At Microscopy Module power-up, the Hard Crash condition is automatically reset by an alternate signal on the SPA SIC. There is a push-button switch on the SPA SIC to manually reset the Hard Crash condition if the incoming Hard Crash signal (from the Hard Crash switch on the SPA arm) is no longer asserted. Under normal conditions, the manual switch is not used. Even when the vertical motor is disabled by the crash relay dropping out, the SPA SIC will still allow upward vertical motion of the SPA arm, but not downward motion.

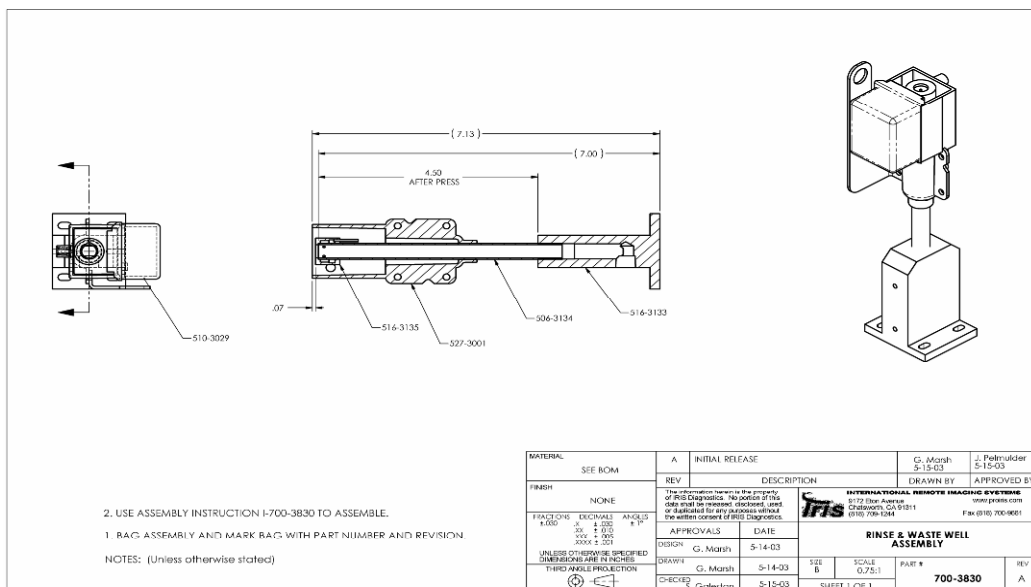
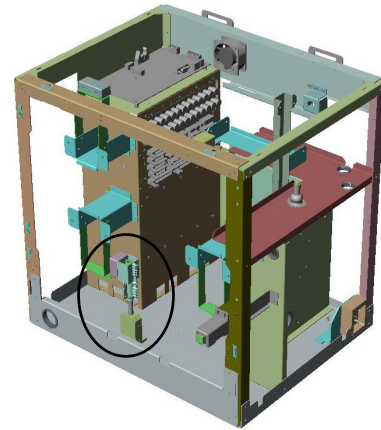
3. Components

Waste/Rinse Well # 700-3830



The Rinse function is used to fill the well with Lamina in order to clean the pipette between sampling.

The Waste function collects all waste liquids (samples and Lamina) used during sample processing, then drains the fluids through the Waste Pump into the waste tubing.



Component drawings may change without notice. Please contact IRIS Diagnostics to determine the current revision level.

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3. Components

Diaphragm Pumps

The diaphragm pumps are DC motor driven pumps located on the left side of the instrument next to the sampler. They are from left to right:

1. Air Pump
2. Waste Pump
3. Rinse Pump
4. Fill Pump

Air Pump # 700-3877

This pump fills the air tank and is used for mixing the specimen through the charge and air mix valves.

Waste Pump # 700-3809

This pump drains the waste well.

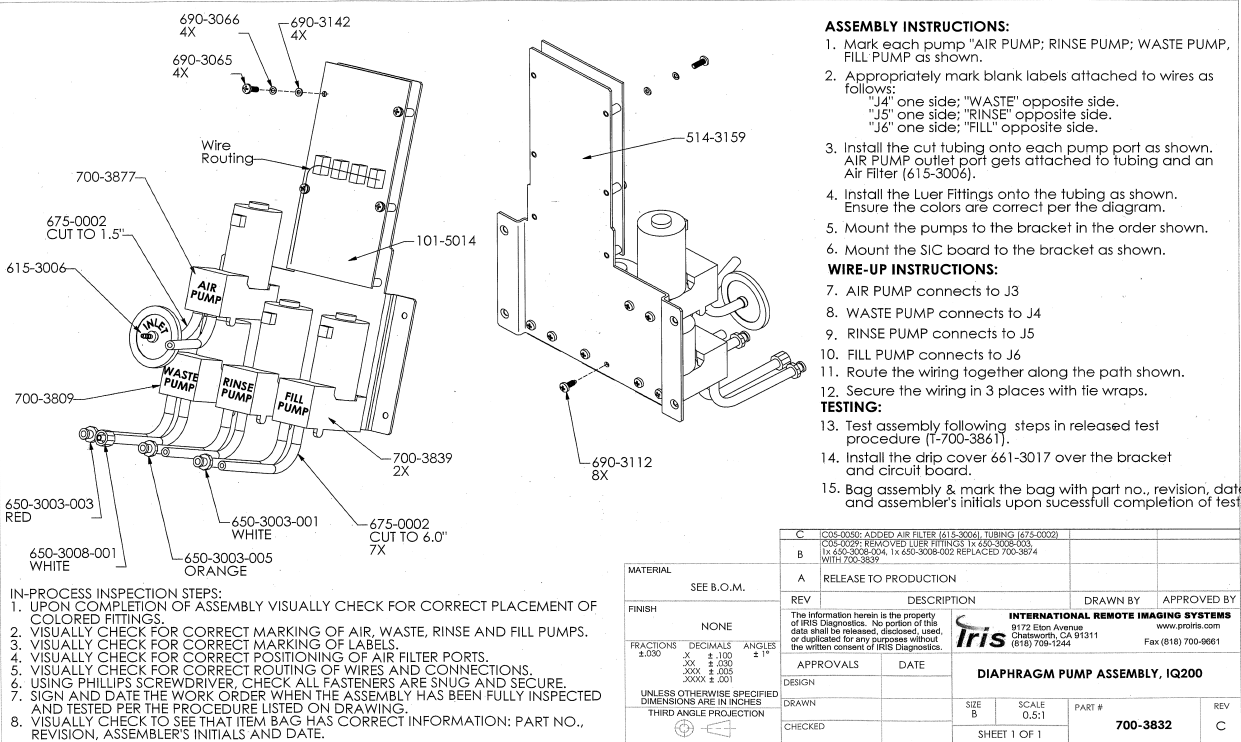
Rinse Pump # 700-3874

This pump fills the rinse well for cleaning the pipette.

Fill Pump # 700-3874

This pump maintains the level inside the Lamina tank.

3. Components



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3. Components

Peristaltic Pumps

Cannula Pump # 700-3820

This pump is used to push the sample into the Flow Cell.

Lamina Pump # 700-3804

This pump is used to backwash the fluidic system. During sample processing, the pump is in Home position allowing Lamina to be directed into the Flow Cell.

Evacuation Pump # 700-3820

This pump is used to:

- aspirate the sample into the pipette
- evacuate liquids from the Flow Cell to the Waste Well
- draw Lamina into the Flow Cell when the Lamina Pump is in Home position.

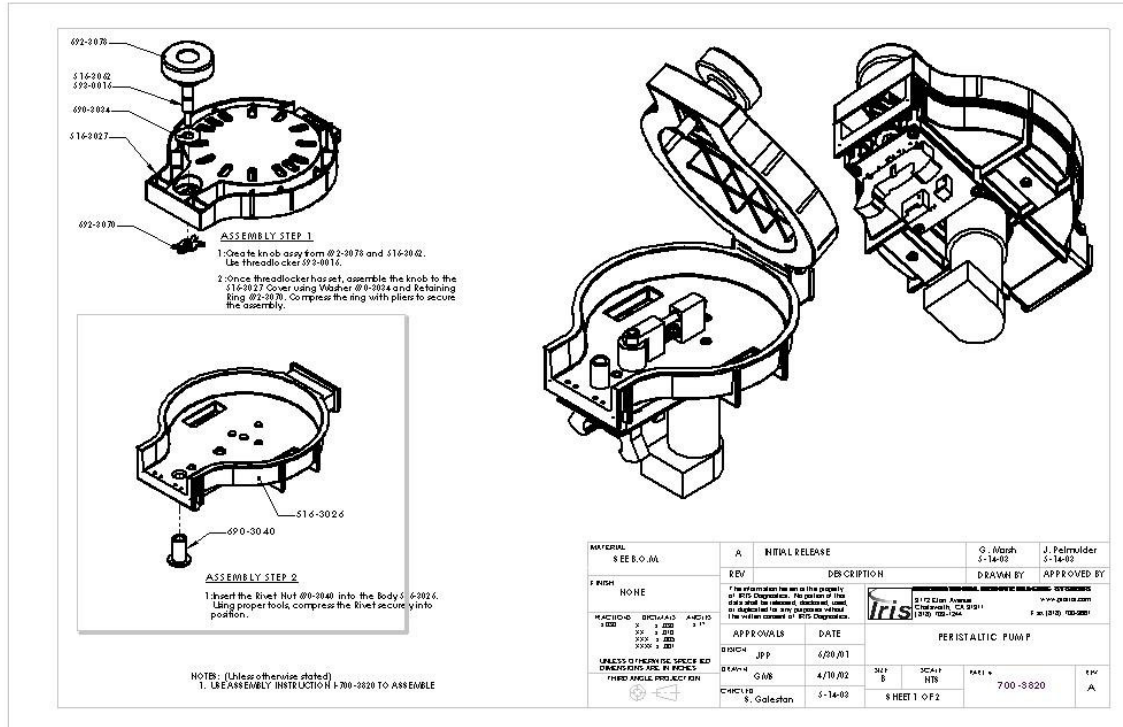
Pump Cover Closed and Cassette-In-Place Detection

Three switches are located on the Pump SIC for cover-closed detection, and for cassette-in-place detection.

The cover-closed detection senses the end of the shaft of the threaded knob that closes the pump cover. If the knob is not fully screwed, the pump will not run.

The Cassette-In-Place detection senses the presence of a small tab on the cassette indicating that the cassette has been inserted into the pump. If the tab is not detected, the pump will not run.

3. Components



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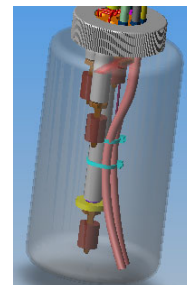
3. Components

Lamina Tank # 700-3784

The Lamina Tank, located on a bracket above the air tank, is used as a reserve to avoid running out of Lamina. The Fill pump fills the Lamina Tank directly from the external Lamina container.

Four liquid level sensors are inside the Lamina tank. From top to bottom:

1. Overflow detector – when this level is reached, the Fill Pump stops filling the tank.
2. Refill detector – when this level is reached, the Fill Pump is activated to refill the tank.
3. Low-level detector – the external Lamina container is empty. An error message with medium priority is generated, sample processing continues.
4. Empty level detector – the external Lamina container is empty. An error message with high priority is generated; sample processing is stopped until a new container is installed.



3. Components

Valves

Solenoid Valves

Located inside the microscopy module, on the right of the Lamina Tank, from top to bottom:

Drain Valve # 700-3844

The Drain Valve is used to remove any air bubble present inside the Flow Cell.

Evacuation Bypass Valve # 700-3843

When this valve is opened, the Evacuation Peristaltic pump aspirates fluids from the drain outlet of the Flow Cell into the Waste Well.

When closed, the valve diverts the flow from the Evacuation Pump to the Waste Well.

Lamina Bypass Valve # 700-3842

When this valve is opened, Lamina goes to the Waste Well.

When closed, Lamina goes to the Flow Cell.

Cannula Bypass Valve # 700-3881

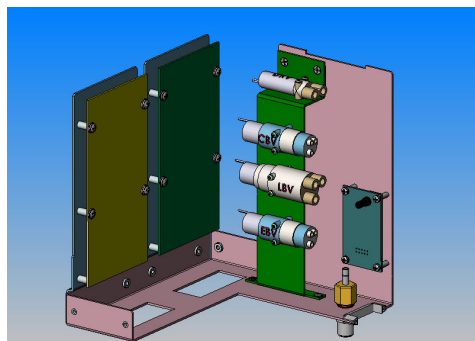
When this valve is opened, Lamina goes to the Flow Cell via the Pipettor Bypass Valve.

When closed, Lamina goes to the Waste Well.

Pipettor Bypass Valve # 700-3880

Located on the Specimen Presentation Assembly. When this valve is opened, sample and/or Lamina go to the Flow Cell.

When closed, sample is aspirated in the flow line.



3. Components

Air Valves

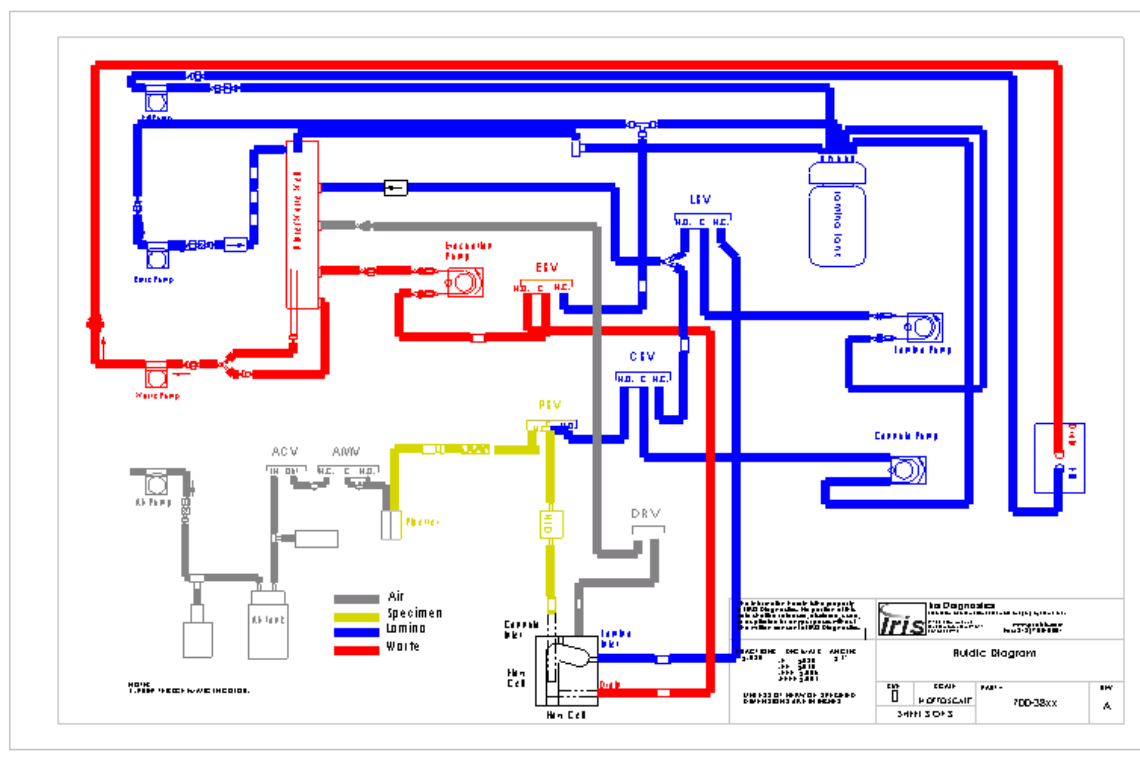
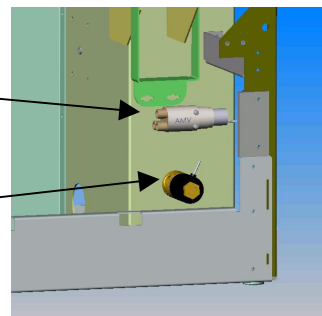
The Air Valves are located on the right front side of the instrument, underneath the Optical Bench Assembly.

Air Mix Valve # 700-3887

The Air Mix Valve is used to mix the specimen inside the sample tube.

Air Charge Valve # 700-3888

The Air Charge Valve is used to refill the pressure in the Air Line for the mixing circuit.



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3. Components

Flow Cell # 525-3077

This precision assembly is where the thin sheet of liquid specimen is presented in a continuous flow microscope-slide manner for observation by the image capturing system. The sample is pulled into the Flow Cell by the Evacuation pump. Lamina encases the sample, keeping the specimen in thin sheet, and keeps the specimen away from the Flow Cell surfaces to minimize surface contamination.

Strobe Light # 065-0059

The strobe light provides short, high-intensity, parallel-light strobe-light pulses on a controlled basis through the thin sheet of specimen. This subsystem includes a 400V to 1000V strobe power supply and a high intensity strobe flash tube.

CCD Camera # 700-3565

The CCD camera, coupled to the Microscope, takes magnified high-resolution digital pictures of the sample going through the Flow Cell.

20 x Objective # 220-3009

The objective magnifies the sample going through the Flow Cell.

Autofocus Motor " Micro-nudger" # 700-3505

This mechanism allows moving the Flow Cell into the appropriate position where the thin specimen is focused for image capture. Focus position is achieved with an ultra-fine-pitch stepper motor providing a movement of about 0.2 microns per full step.

3. Components

Power Supply # 230-3000

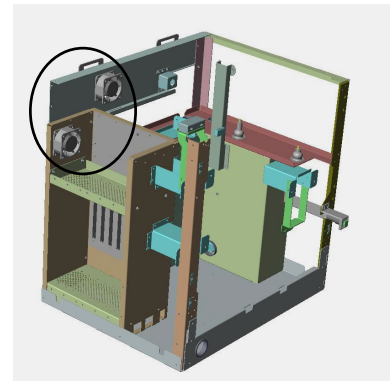
This assembly includes the international-voltage-range AC-line-to-DC converters to generate +24V and +5V regulated DC for the entire Microscopy Module, and the strobe power supply. The regulated voltages out of the Power system assembly are brought to the Power SIC through a 10-wire cable and a locking Molex connector.

Cooling Fans # 700-3892 & 700-3412

While the Microscopy Module is designed to operate with only natural convection, at higher ambient temperatures, it may be necessary to use some forced-air cooling.

Two fans are present: one in the card cage area, and one in the main instrument area. These fans are turned on by +24V power switched on when the temperature sensed by a local thermistor goes above $34^{\circ}\text{C} \pm 1^{\circ}\text{C}$ and switched off when the temperature goes below $29^{\circ}\text{C} \pm 1^{\circ}\text{C}$.

These fans plug into individual 2-pin connectors on the Backplane.

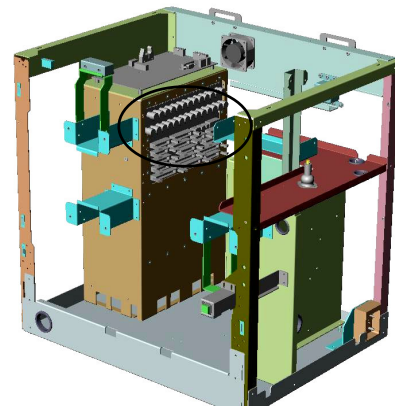


Fuses and Visible LEDs

The fuses are quick-acting, miniature and pluggable. The fuse socket is soldered to the PCB and has a threaded plastic cap that mechanically retains the fuse. Three different fuse ratings are used:

- 0.50 A Iris 056-3000
- 1.0 A Iris 056-3004
- 2.5 A Iris 056-3001

The Backplane has 22 fuses and 22 visible red LEDs. Each LED is associated with a power protection fuse, and the LED lights only when DC power is on (via the Power SIC) and the fuse is blown.



3. Components

The fuses are mounted in two rows, with even number fuses on the top and odd numbered fuses on the bottom; fuse numbers increasing from left to right. The LEDs are mounted in a single row between the fuses, and each vertically aligned with its associated fuse.

Assignment of these Fuses and LEDs is given in the table below where the “Protects power through” column refers to the Backplane connector through which the protected power leaves the Backplane PCBA.



Note that three of the fuses have their power provided through SSMB circuits, and the LEDs will not light, even when the fuse is blown, if the corresponding SSMB is not plugged into the Backplane.

Backplane Fuses and LEDs

Fuse & LED	Fuse Rating	Protects power through	Voltage and Function Protected
F3 D3	0.50A	J19	+5V SPA SIC
F4 D4	2.5A	J20	+24V Sampler measurement stepper (through SSMB1)
F5 D5	2.5A	J20	+24V Sampler front stepper (through SSMB1)
F6 D6	0.50A	J23	+5V Pump SIC: Lamina Pump, STM SIC
F7 D7	0.50A	J22	+5V Pump SIC: Cannula Pump
F8 D8	0.50A	J21	+5V STM Sampler
F9 D9	0.50A	J14	+5V OBA power
F10 D10	1.0A	J11	+24V Rear Panel SIC power
F11 D11	2.5A	J18	+24V Do-All SIC power
F12 D12	0.50A	J18	+5V Do-All SIC power
F13 D13	0.50A	J11	+5V Rear Panel SIC power
F14 D14	0.50A	J21	+24V Sample Transport Module SIC power

3. Components

Fuse & LED	Fuse Rating	Protects power through	Voltage and Function Protected
F15 D15	0.50A	J14	+24V OBA focus stepper power (through SSMB2)
F16 D16	0.50A	J10	+5V Status Board power
F17 D17	0.50A	J12	+5V FSV SIC power
F18 D18	0.50A	J13	+5V Barcode Reader power
F19 D19	1.0A	J12	+24V FSV SIC power
F20 D20	0.50A	J17	+5V Pump SIC: Evacuation Pump
F21 D21	0.50A	J24, J25	+24V Fan power
F22 D22	0.50A	J16	+5V Power SIC Camera Circuits power
F23 D23	2.5A	J16	+24V Strobe Power Supply power
F24 D24	1.0A	J16	+24V Camera 24VDC to 12VDC Inverter power

3. Components

PCBA Summary

Many of the boards have LEDs indicating dynamic operating status of the board and its controlling firmware.

Item No	Board name or Sub assembly	Number	# in system	Location
1	HLCB	101-5057	1	Card cage
2	MSCB	101-5001	4	Card cage
3	DCVB	101-5043	2	Card cage
4	SSMB	101-5059	2	Card cage
5	Backplane	101-5003	1	Card Cage
6	SPA SIC	101-5004	1	Behind SPA
7	Pump SIC	101-5010	3	Behind Peri-pump
8	OBA SIC	101-5053	1	Side of Optical bench
9	STM SIC	101-5014	1	Above pumps left panel
10	Pressure Transducer Board	101-5016	2	Valves mounting next to optical bench
11	Power SIC	101-5020	1	Above cardcage
12	Rear Panel SIC	101-5058	1	Behind backplane
13	SM Status Board	101-5032	1	Top left front panel
14	STD Board	101-5034	1	Inside tube detector
15	FITD	101-5041	4	Waste well – pressure transducer
16	FSV SIC	101-5045	1	Right board behind lamina container
17	Do-All SIC	101-5046	1	Left board behind lamina container
18	Waste Well Electrode Board	101-5047	1	Waste well
19	ESN Board	101-5049	42	
20	SPA Opto Board	101-5052	1	SPA
21	Lamina ESN Bd	101-5048	1	Inside lamina container
22	Waste Well FITD	101-5054	1	Waste well
23	OBA Focus Home	101-5055	1	Above CCD camera



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3. Components

Cardcage

The Microscopy Module control center is the cardcage, and is composed of the Microscopy Module backplane, assembly number 101-5003, and nine circuit boards (called the **Cardcage boards**). The backplane has nine 120-pin DIN connectors into which the Cardcage boards plug. The color of the card guides for each slot position identifies the type of board required in the slot—the color of the board's plastic card ejector should match the color of the card guide. There are also 16 other connectors on the backplane for interface to the rest of the SMCS system.



High Level Control Board (HLCB), # 101-5057

The HLCB, located in slot #1, is the highest level controlling entity in the Microscopy Module. It includes the Master Controller, six high-level controllers, and the FQM low-level controller that itself controls a multi-point scanner. There is **one** HLCB with **white** card ejectors.

Motor/Scanner Control Board (MSCB), # 101-5001

The MSCB provides low-level closed-loop control over two independent DC motor/encoders and a multi-point scanner. There are **four** MSCB boards with **blue** card ejectors. They are interchangeable.

- Slot 2 Sample Presentation Assembly
- Slot 3 Sample Presentation Assembly
- Slot 6 Fluidic block
- Slot 7 Sample Transport Module (sampler)

DC Valve Board (DCVB), # 101-5043

The DCVB provides control for solenoid-operated valves, and includes the ability to electrically measure activation and release operation of the valves being controlled. There are **two** DCVB boards with **green** card ejectors. They are interchangeable.

- Slot 4 Sample Presentation Assembly
- Slot 5 Fluidic block

3. Components

Stepper/Scanner/Motor Board (SSMB), # 101-5059

The SSMB, located in slots 8 and 9, provides control for two stepper motors, low-level closed-loop control DC for one DC motor/encoders, and a multi-point scanner. There are **two** SSMB boards with **yellow** card ejectors. They are interchangeable.

- Slot 8 Sample Transport Module (sampler)
- Slot 9 Optical Bench Assembly

Backplane # 101-5003

Except for power and signal distribution, analog input signal EMI filtering, protection of power, and fuse status resistor divider networks, the backplane has no other function. It has no active elements.

Backplane SMCS Interconnect Connectors

Connector	Type	Connects to	Function
J10	20-pin ribbon header	SM Status Board J1	SM Status Board signals
J11	26-pin ribbon header	Rear Panel SIC J5	Rear Panel SIC
J12	40-pin ribbon header	FSV SIC J1	FSV Valve interface
J13	10-pin ribbon header	Barcode Reader	Bar Code Reader
J14	20-pin ribbon header	OBA SIC J1	OBA signals
J15	10-pin ribbon header	Power SIC J3	Strobe PIC control
J16	14-pin Molex receptacle.	Power SIC J2	Power to/from Power SIC
J17	20-pin ribbon header	Evacuation Pump SIC J1	Evacuation Pump
J18	40-pin ribbon header	Do-All SIC J1	Do-All SIC signals
J19	34-pin ribbon header	SPA SIC J1	SPA SIC signals
J20	16-pin ribbon header	STM SIC J12	STM Motor signals, STM J02
J21	34-pin ribbon header	STM SIC J11	STM Optical signals, STM J01, STM STD, diaphragm pumps, STM tether ESN, Barcode reader ESN tether.
J22	20-pin ribbon header	Cannula Pump SIC J1	Cannula Pump
J23	20-pin ribbon header	Lamina Pump SIC J1	Lamina Pump
J24	2-pin receptacle.	Cardcage Fan	Cardcage fan
J25	2-pin receptacle.	Main SM Fan	Main SM fan

3. Components

Signal Interface Concentrators (SICs)

While the SMCS card cage is the central brain of the SMCS, the control and monitor signals of the SMCS must reach the electrical hardware that it is measuring and controlling. To achieve this signal distribution, the SMCS includes many "Signal Interface Concentrators" PCBAs (**SICs**) located throughout the SM.

The SICs provide a local place where the individual elements of the particular subsystem of the SM have their electrical signals "concentrated." In some cases, there is ESN capability on the SICs.

Power SIC # 101-5020

The Power SIC provides a controlled interface between the DC power supply, and the rest of the SMCS. It also provides controlled power to the Strobe. The Power SIC is mounted atop the SMCS Cardcage, and interfaces to backplane connector J15 through a 10-wire ribbon connector, and to backplane connector J16, a 14-wire discrete wire connector with large gauge wires carrying the actual power signals. The Power SIC receives power directly from the DC Power supply via another 10-pin discrete wire connector. It also provides 12-volt regulated power to the CCD camera. The power delivered to the Cardcage (and the rest of the SMCS) is switched off and on by a logical signal from the SM front panel "Standby" switch.

The Power SIC connectors are summarized in table below.

Connect.	Type	Connects to	Function
J1	10-pin discrete female header Molex MiniFit Jr	Power Supply DC terminals Cable, P1	Unswitched regulated power from power supply
J2	12-pin discrete female header Molex MiniFit Jr	Cable to Backplane, J16	Switched/Fused power to/from backplane
J3	10-pin ribbon header w/locks	Cable to Backplane, J15	OBA SIC PIC16 control
J4	5-pin discrete header	Cable to Video Camera	Power to camera, sync from camera
J5	6-pin discrete header	Cable to Strobe power supply	Strobe power, strobe trigger
J6	3-pin discrete header	Cable to SM front panel standby-switch	SMCS power off/on logic control, +24V to indicator LED in switch
J202	20-pin shrouded ribbon header	(test programming cable)	PIC programming during test
J203	10-pin shrouded ribbon header	(test diagnostic cable)	Quad RS-232 driver bd (test & diagnostics)



3. Components

Pump SIC #101-5020

The Pump SIC concentrates the signals from the elements of a peristaltic pump assembly, including: the DC pump motor, its rotation encoder, the home detect optical sensor, a cassette-in-place switch and a pair of cover-closed switches. The signals from a Pump SIC connect to the SMCS backplane through a 20-wire ribbon cable. The three Pump SICs in the SMCS:

1. Evacuation Pump assembly, connected into backplane connector J17,
2. Cannula Pump assembly, connected into backplane connector J22,
3. Sheath Pump assembly, connected into backplane connector J23.

The Pump SIC connectors are summarized in table below.

Connect.	Type	Connects to	Function
J1	20-pin ribbon header	Backplane: J17 (Evacuation pump) J22 (Cannula pump) J23 (Lamina pump)	Main signals to SMCS for: Evacuation pump, Cannula pump, or Lamina pump
J2	12-pin female ESN	DC motor and encoder assy, P1	Motor and Encoder signals

FSV SIC # 101-5045

The Fluid System Valve (**FSV**) SIC concentrates the leads from up to 12 solenoid valves that operate the fluid system. The signals are brought to SMCS backplane J25 through a 40-wire ribbon cable. The FSV SIC is mounted alongside the Do-All SIC on the Fluid System Valve Assembly.

3. Components

The FSV SIC connectors are summarized in table below.

Connect.	Type	Connects to	Function
J1	40-pin ribbon header	Backplane J12	Main signals to SMCS
J2	12-pin female	Not used	
J3	12-pin female	Not used	
J4	12-pin female	Not used	
J5	12-pin female	Not used	
J6	12-pin female	CBV	Operates CBV
J7	12-pin female	ACV	Operates ACV
J8	12-pin female	LBV	Operates LBV
J9	12-pin female	DRV	Operates DRV
J10	12-pin female	AMV	Operates AMV
J11	12-pin female	PBV	Operates PBV
J12	12-pin female	EBV	Operates EBV
J13	12-pin female	Not used	
J14	12-pin female	Not used	
J15	12-pin female	Not used	
J16	12-pin female	Not used	

3. Components

SPA SIC # 101-5004

The SPA SIC incorporates signals from the SPA. It is mounted directly to the SPA assembly. It has two 12-pin ESN connectors for the interface to the two DC motors/encoders (rotational and vertical) of the SPA, an ESN connector for the bottom vertical limit sensor, a 10-pin ribbon header for connection to the SPA Optical Board (for detection of rotational limits and vertical top limit), an ESN connector for the crash detection assembly, and a final ESN connector for a tethered ESN to the entire SPA assembly. The interface from the SPA SIC to SMCS backplane J19 is through a 34-wire ribbon cable.

SPA SIC Visible LEDs

The SPA SIC has 7 visible LEDs through which an observer can deduce operational status of the SPA. The LEDs are identified in table below.

Item	LED legends	LED color	# LEDs
Vertical Motor Encoder Signals	Rot A, Rot B	Green	2
Horizontal Motor Encoder Signals	Rot A, Rot B	Green	2
Crash Status	Vert OK	Green	1
Crash Status	Vert Crash	Red	1
Motors Disabled	Motors Disabled	Red	1

3. Components

SPA SIC Push-Button Switches

There is a single push-button on the SPA SIC that manually resets the Hard Crash condition if the incoming Hard Crash signal (from the Hard Crash switch on the SPA arm) is no longer asserted.

Connect.	Type	Connects to	Function
J1	34-pin ribbon header	Backplane J19	Main signals to SMCS
J2	12-pin female	SPA Assy Tether ESN	SPA Assy ESN
J3	12-pin female ESN	SPA Vertical Motor ESN	SPA Vertical Motor ESN, DC motor and encoder
J4	12 pin female ESN	SPA Rotation Motor	SPA Rotation Motor ESN, DC motor and encoder
J5	12-pin female	SPA Crash Detector Switches	SPA Crash Detection
J6	12-pin female	SPA Bottom Sensor switch ESN	SPA Bottom Sensor ESN and switch
J10	10-pin ribbon header	SPA Opto Bd	SPA vertical & rotational homes and other limit.

3. Components

OBA SIC #101-5053

The OBA (Optical Bench Assembly) SIC incorporates all of the signals from the optical bench. The interface to SMCS backplane J14 is through a 20-wire ribbon cable (J1). The OBA SIC translates the unipolar stepper drive signals from the SSMB to bipolar drives suited for the micro-stepper used in the OBA. The OBA SIC reads the sense signals from the stepper motor assembly to limit movement in the event of reaching a motion limit in one direction or the other. The OBA SIC is physically mounted on the OBA.

The OBA SIC connectors are summarized in table below.

Connector	Type	Connects to	Function
J1	20-pin ribbon header	Backplane J14	Main signals to SMCS
J2	12-pin female ESN	Focus Stepper Motor P1	Stepper Motor Phase Coils
J6	12-pin female ESN	OBA thermistors P1	OBA ESN
J7	12-pin female ESN	Not used	Camera tethered ESN
J8	12-pin female ESN	Not used	Strobe Trigger Unit tethered ESN
J9	12-pin female ESN	Not used	Strobe Bulb tethered ESN
J10	12-pin female ESN	Not used	Strobe Bulb tethered ESN
J11	12-pin female ESN	Not used	Flow Cell tethered ESN
J12	12-pin female ESN	Focus Position Optical Sensors P1	Iris config.: Dual opto-focus home. Newport config.: end limits for linear actuator.

3. Components

Do-All SIC # 101-5046

The Do-All SIC is used for interfacing to SMCS backplane J18 through a 40-wire ribbon cable, and providing a concentrating place for the cables to all of the SMCS pressure transducers, the FITDs. The Do-All SIC is mounted alongside the FSV SIC on the Fluid System Valve Assembly.

The Do-All SIC connectors are summarized on the table below.

Connect.	Type	Connects to	Function
J1	40-pin ribbon header	Backplane J18	Main signals to SMCS
J2	10-pin ribbon header	Pressure Transducer #1	Pressure Transducer #1
J3	10-pin ribbon header	Not used	Not used
J4	10-pin ribbon header	Not used	Not used
J5	10-pin ribbon header	Not used	Not used
J6	12-pin female	Not used	Not used
J7	12-pin female	Not used	Not used
J8	12-pin female ESN	FITD #3 P1	Specimen FITD
J9	12-pin female ESN	FITD #4 P1	Waste Well FITD
J10	12-pin female	Not used	Not used
J11	12-pin female	Not used	Not used
J12	12-pin female	Not used	Not used
J13	12-pin female	Not used	Not used
J14	12-pin female	Not used	Not used
J15	12-pin female	Not used	Not used
J16	12-pin female	Not used	Not used

3. Components

Rear Panel SIC # 101-5058

The Rear Panel SIC provides the signal interface from the SM to the external world through three DB9F connectors. It has an internal interface to the internal Lamina Container level sensor. It provides an ESN connector for the cooling fan, and a tethered ESN for identifying the SMCS power supply. It connects to backplane connector J11 through a 26-wire ribbon cable (J1).

STM SIC # 101-5014

The STM SIC provides an interconnect capability between the two built-in cables from the Arkray STM to the Microscopy Module. It interfaces to the cardcage backplane connectors J20 and J21. It is also the interface point for the diaphragm pumps of the Microscopy Module, the Specimen Tube Detector (mounted on the STM), and the tethered ESNs for the STM and for the Barcode Reader.

Other PCBAs

Lamina cable # 101-5048

The Lamina cable is used as part of the Lamina Container Assembly for interfacing (and identifying) the float sensor switches of that assembly. It provides for three of the four switches on the Lamina Container Assembly to be summed through a weighted resistor network for a pseudo-analog level detection scheme.

FITD PCBA # 101-5041

The PCB of this assembly is incorporated into two different subassemblies for detecting the presence of water-based fluids in its proximity.

SM Status Board PCBA # 101-5032

The SM Status board is both a display panel providing a user visual interface and covers interlock switches for the top cover and the front access door. It interfaces to SMCS backplane J10 through a 20-wire ribbon cable.

STD PCBA # 101-5034

The Specimen Tube Detector board is a small electro-optics assembly that is part of the Specimen Tube Detector. It senses the presence of a



3. Components

specimen test tube at the STM test station. It has a 6-pin connector for interface to the STM SIC.

Pressure Transducer Board #101-5016

The Pressure Transducer board is mounted to a pressure transducer and a signal-conditioning amplifier to provide a pressure signal from a liquid or air medium. The board electrical interface is via an integral 10-pin ribbon cable. The Air Storage pressure transducer connects to J2 of the Do-All SIC.

SPA Optical Board # 101-5052

This board supports three optical interrupters, and is mounted on the top of the SPA assembly. Two of the interrupters are for the SPA arm rotation movement home and forward limit detections, and the third is for the Vertical movement (top) home detection.

LED Visual Indicators

LED visual indicators are used throughout the SMCS to provide local indication of status. LEDs will be red, green, and yellow (or amber). Generally, the red LED will indicate a fault condition, and the yellow LED will indicate a “caution” condition.

1. On the Cardcage boards, the LEDs are positioned in two rows at the front edge of the board where they are viewed normal to the board's surface, but they can be seen in a front view of the card cage by viewing slightly towards the component side of the PCBs.
2. On the SMCS backplane, they are located in the area above the connectors, generally non-obscured by the cables connected to the backplane. All of the LEDs on the backplane are red, and indicate which (if any) of the 22 fuses are blown.
3. On the various remote circuit boards, they are appropriately placed for the application.

4. Adjustments

4

Adjustments

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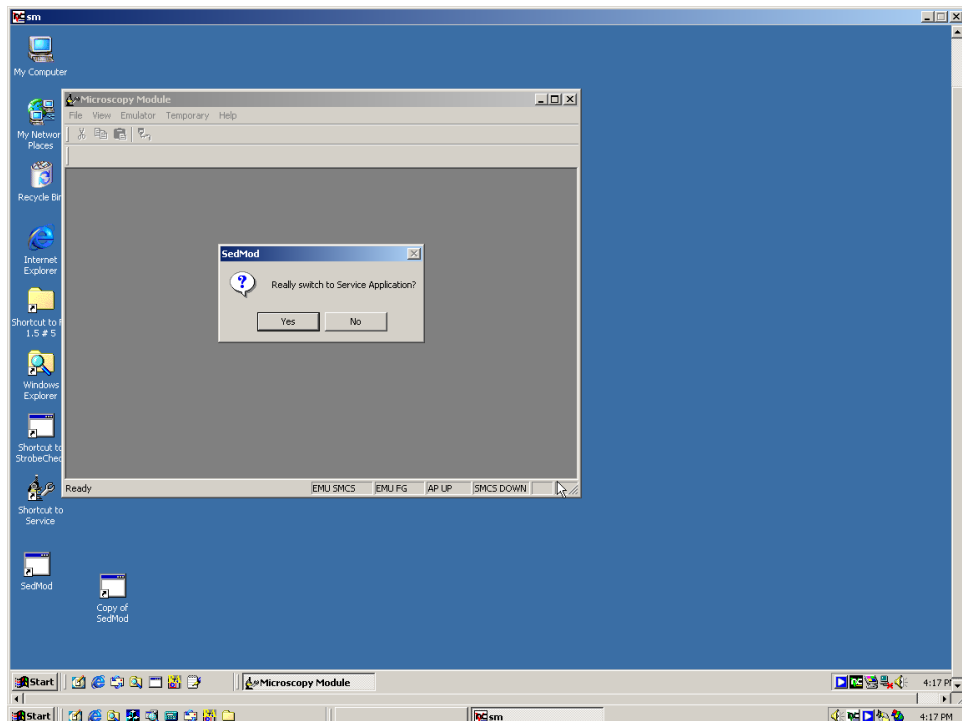


4. Adjustments

Accessing the Service Screen

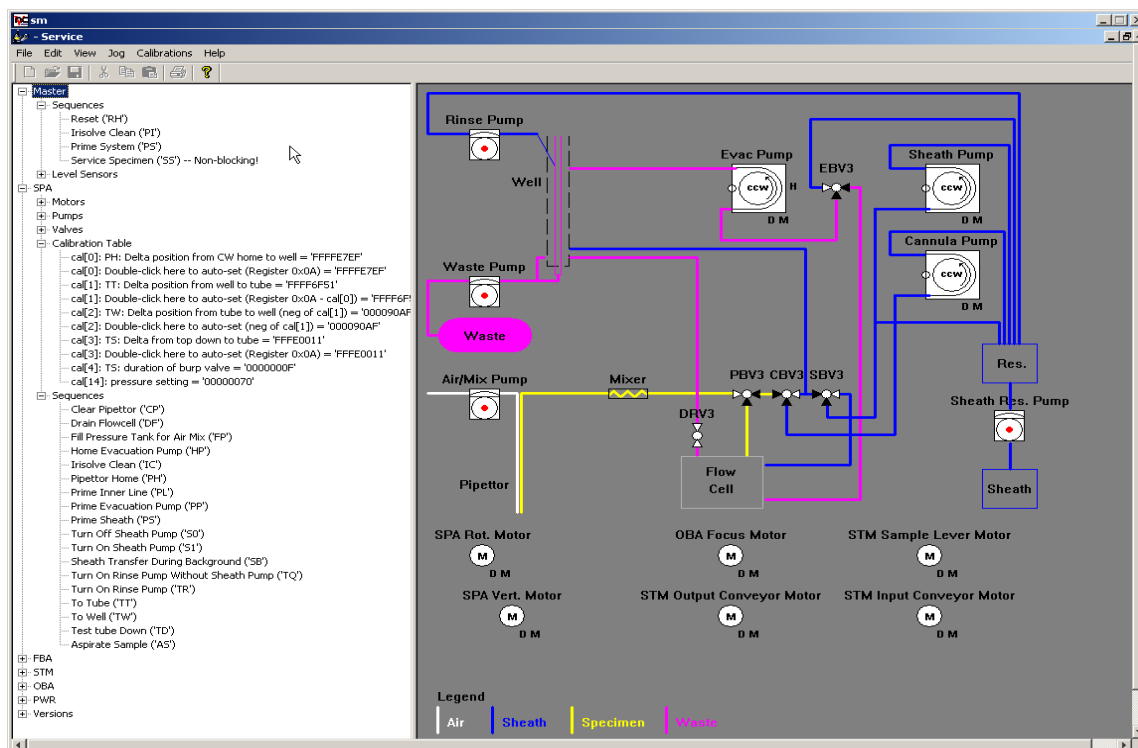
Press the Windows key on the keyboard (located between Ctrl and Alt keys). The Windows toolbar will be displayed at the bottom of the screen.

On the tool bar, left click on SM. The screen will display the SM screen. Select **File – Switch to Service Application**.



Select **Yes** to switch to Service Application. The system will prompt to switch off the Microscopy Module. When connections are established with the Results Processor, the system will prompt you to turn the Microscopy Module back on. After about 1 minute, the **Service Screen** will be displayed.

4. Adjustments



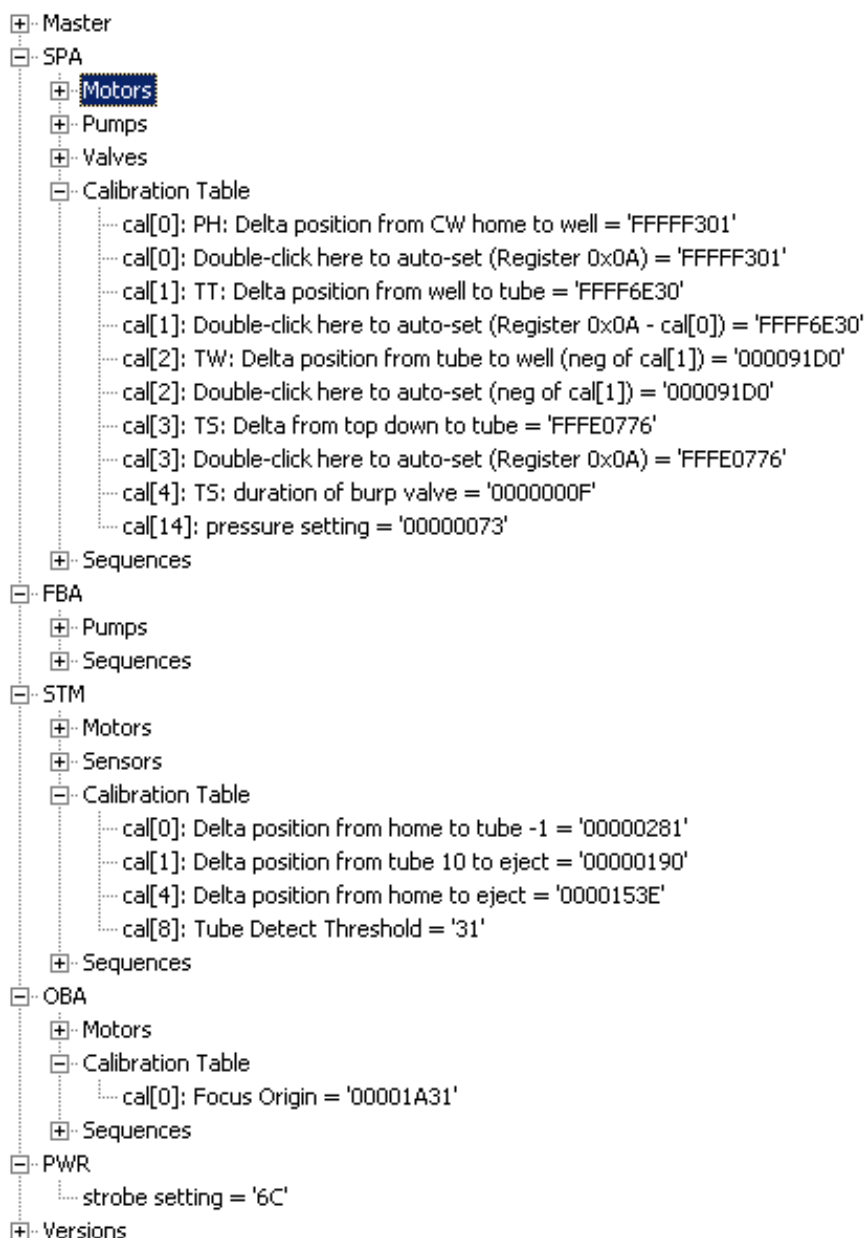
Calibration Table

The tree displays relevant calibration table entries. Each entry indicates its calibration table position as well as its purpose and often the sequence from which it's activated (e.g., "cal[1]: RC: CP Velocity for fast push" indicates calibration table index 1, activated from sequence "RC", purpose "Velocity for fast push"). In general, if you double-click on a calibration table entry you will be prompted for a new value to set.

Calibration Auto-Sets

In some cases there is more than one item in the tree for a given calibration table entry. In such cases, the second entry provides a more convenient way to set the value. The label indicates what the shortcut will do; double-click on the shortcut to perform the action. For example, "cal[1]: Double-click here to auto-set (Register 0x0A - cal[0])" will set calibration table entry 1 to the difference of register 0x0A and calibration table entry 0. See [Register 0x0A](#).

4. Adjustments



4. Adjustments

Sampler Calibration

Test tube position #5

The purpose of this calibration is to properly set the location of the #5 test tube rack position. The other positions are set automatically.

Material required

Normal control rack with rubber tube rest removed from tube position 5.

Procedure

1. Start Service Application, then power up the iQ200.
2. Place the control rack on the right side of the Sample Transport Assembly.
3. Open the **"STM"** from the Service Application menu tree then **"Sequences"** then double click **"Initialize Rack ('M1')"** then **"OK"**.
4. From the Service Application menu tree under (**STM, Sequences**) select, then double click **"Move Next" ('MN')** then **"OK"**. Repeat 4 times so as to be in the 5th position of the rack.
5. The hole in the bottom of tube position 5 should be centered over the floor plates of the Sampler.
 - a. If the hole is aligned directly in the center of the floor plates, no further calibration is required.
 - b. If the hole has stopped short of or passed over the floor plate edges, a new calibration value must be entered.
6. To change the calibration value, go to the **STM's** Calibration branch and double click on **"Delta position from home to tube -1=XXXXX"**. The position is controlled by Table Index "XP 00" which is set to a value of "00000280". Re-set this value higher or lower depending on the position desired.



Note: Value "00000275" will position the rack short of the original value, "00000285" will move the rack further than the original value.

4. Adjustments

Distance to eject the rack to the unload station.

The purpose of this calibration is to properly set the distance to eject the rack from the sampler so the rack transfers the correct distance onto the unload station.

Material required

Two routine racks
One glass 16 x 100mm test tube

Procedure

1. Start Service Application.
2. Place a routine rack on the left side of the Sampler in the transfer position.
3. Place a routine rack on the right side of the sampler.
4. From the Service Application menu, click on **"STM"** then **"Calibration table"**
5. Click on **"Sequences"** then double click **"Initialize Rack ('M1')"** then **"OK"** to activate the Sampler and present the test tube rack to the #1 position.
6. When you double-click on the **"MN"** **"Move Next"** command, a signal is sent to eject the rack to the unload station.
7. Measure the distance between the end of the rack and the frame of the unload station. There should be approximately three millimeters between the rack and the frame.
8. If this distance is not correct, change the **cal [3]: Distance to eject to stock yard**.
9. Double click on the line **cal [3]: Distance to eject to stockyard** to bring up the cal value entry window. Increase or decrease the number to change the distance the rack is ejected to the unload station.



Note: Changing the value 10 Hex will change the rack move distance approximately 1 millimeter.

10. Repeat the **"MN"** **"Move Next"** command as needed to repeat this test.

4. Adjustments

Specimen Tube Detector Calibration

The purpose of this calibration is to set both the tube detector alignment and sensitivity. The Specimen Tube Detector is an electro optical device used to detect the presence of a specimen tube in the tube rack. The STD emits a beam of light directed at the #1 tube position, which reflects off the surface of the tube back to a collector in the STD. The intensity of the reflected beam is converted to a hexadecimal value. This value is compared to the pre-set threshold value. If the value is above the threshold, the software concludes a tube is present.



Note: Make sure the Sampler calibration has been performed **BEFORE** calibrating the Specimen Tube Detector.

Material required

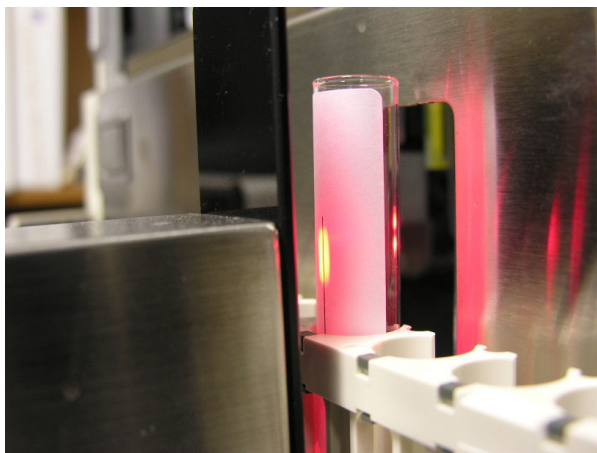
Routine rack with retaining clip on #5 position.
One glass 16 x 100mm test tube with blank label with vertical centerline drawn on it.

Procedure

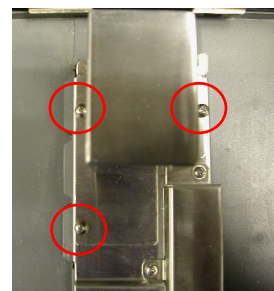
1. Start Service Application.
2. Insert the tube with white label and vertical centerline drawn on it, making sure it is correctly oriented in #5 position. Place the Routine Rack on the right side of the Sampler.
3. From the Service Application menu, click on **"STM"** then **"Sequences"** then double click **"Initialize Rack ('M1')"** then **"OK"** to activate the Sampler and present the test tube rack to the #1 position.

4. Adjustments

4. Double-click on “**MN**” “**Move Next**” command until the tube is presented before the tube detector.



5. Verify that the tube detector's red spot is centered on the tube's centerline as shown. Physically adjust the tube detector if necessary:
 - a. Loosen the retaining screws.
 - b. Adjust the STD position until the red spot is centered on the line.
 - c. Tighten the retaining screws to secure the STD.
6. Double-click on “**MN**”, then **OK** to move to the next empty position.
7. From the Service Application STM menu, click on “**Sensors**” then double-click “**tube detect (raw)**”
8. Record the value for no tube position.
9. Use the **hexadecimal** calculator to compute the new threshold value: (no tube recorded value + 5 Hex).
Example: If the no tube threshold is 1F + 5 Hex = 24. Enter this calculated value in the Tube Detect Threshold field.
10. From the Service Application menu, click on STM's “**Calibration Table**”, then click on “**Tube Detect Threshold**”, enter the calculated value and click “**OK**”.



4. Adjustments

STD Verification Procedure

Test Configuration	Tube Detect Range	Your value
Glass tube with white label facing STD	Between 0X90 – 0XFF	
No tube	Between 0X20 – 0X80	
	Range =	

Using the hexadecimal calculator, subtract No Tube value from glass tube with label value to obtain the range.

Range should be greater than 0X30Hex

Replace STD assembly if this test fails

4. Adjustments

Specimen Presentation Assembly (SPA) and Waste/Rinse Well Calibration

This procedure describes the steps necessary to calibrate the SPA module and the Waste Well with respect to each other and the #1 tube position of the Sampler.



Note: Make sure the Sampler calibration has been performed **BEFORE** calibrating the Specimen Tube Detector.

Material required

Normal Specimen Rack with test tube in position #1.

Procedure

Waste Well Positioning

1. Start Service Application.
2. Insert a Normal Specimen rack with a standard glass tube in position #1 and place the rack on the right side of the sampler.
3. From the Service Application menu tree, open **SPA** and then open the **SPA's Calibration table**.
4. From the top windows tool bar click **Jog**.
5. Select **SPA Rotational Jog** (The Jog Velocity window will appear)
6. From the Jog Velocity window, select **Home**.



NOTE: The pipette tip should be located directly behind the rinse/waste well.

7. Using the up down arrows on the keyboard, center the pipettor over the Waste Well and click **Home** then **OK**.
8. From the Service Applications menu tree **SPA Calibration table** Double click on **cal[0]** Double-click here to auto-set the new waste well calibration value.
9. Click **YES** to confirm. Your new calibration value has now been set.
10. Verify proper setting:
 - a. From the **SPA** menu tree open **Sequences** and select **Pipettor Home** ('PH') and then **OK** to execute. Verify the pipette tip is centered over the Waste Well.



NOTE: This should position the test tube located in position 1 into the correct sampling position. If not recalibrate the **STM**.

4. Adjustments

Test Tube Centering Position

1. Open the **STM** branch from the Service Application menu tree.
2. Open **Sequences** and double click **Initialize Rack "M1"** and click **OK** to execute the command. This positions the rack at the #1 tube position.
3. From the top windows tool bar click **Jog**.
4. Select **SPA Rotational Jog** (The Velocity window will appear).
5. From the Jog Velocity window, select **Home**.
6. Using the up down arrows on the keyboard, center the pipette over the center of test tube located in position #1 and then click **Home** then **"OK"**.
7. From the SPA calibration table Double click on **cal[1]:Double-click here to auto set** to store test tube #1's new calibration value.
8. Click **YES** to confirm. Your new calibration value has now been set.
9. Immediately, double-click on Cal [2]: **Double-click here to auto set** to auto set neg value of CAL 1.
10. Click **YES** to confirm.
11. Verify proper setting:
 - a. From the Service Application menu tree, under **SPA Sequences** double click on **"Pipettor Home "PH"**.
 - b. Click **OK** to execute and verify the pipette tip is centered over the Waste Well.
 - c. Double click on **To Tube "TT"** and click **OK** to execute and verify the pipette tip is centered directly over the center of test tube #1.
12. Exit the service application.

4. Adjustments

Test Tube depth positioning

SPA pipette depth calibration check:

1. On the Service Application's SPA "HVL Sequences" branch, click on "P0" pipette home and rotate to the tube
2. Then click on "P0" pipette home and rotate to the tube
3. Then click on "P1" pipette down to tube – during this sequence you should check that the pipette descended down with only 3mm clearance with a tolerance of $\pm 0.5\text{mm}$.
4. Then click on "P2" pipette up and rotate and down to waste well and finally up from waste well.



4. Adjustments

SPA pipette depth adjustment:

1. This procedure should only be done if it is determined that the test tube depth positioning is incorrect. From the top windows tool bar click **Jog**.
2. Select **SPA Vertical Jog** (The Velocity window will appear).
3. From the Jog Velocity window, select **Home**.
4. Using the up down arrows on the keyboard, lower the pipette into the test tube until it's 3mm from the bottom of the tube (the test tube can be lifted to determine the distance the pipette is from the bottom of the tube) then click **Home** then "**OK**".
5. From the Service Applications menu tree SPA Calibration table
Double click on **cal[3]:Double click here to auto set**.
6. Click **YES** to confirm. The new calibration value has now been set.
7. From the SPA sequence menu, double-click **PH-Pipettor Home**.
8. Perform the "SPA pipette depth calibration check" procedure. If the system hangs during this procedure, you will need to call Iris Technical Service for cal [31] to determine this new calibration value.
9. Exit Service Mode.

4. Adjustments

Waste Well Depth Positioning

Cal 31 value is pre-set in factory. If any adjustment is needed, contact Iris Technical Services.

Lamina Consumption Adjustment

Cal 30 value is pre-set in factory. If any adjustment is needed, contact Iris Technical Services.

4. Adjustments

Air Pressure Calibration

Material required

Calibrated air pressure gauge
16 x 100 mm round bottom glass tubes
Iris Diluent

Procedure

1. Remove the shield to access the front of the instrument.
2. Insert a T fitting between the air pressure pump line and the air pressure bottle (black connector).
3. Run a line from the T fitting to a calibrated air pressure gauge.
4. Place a tube with 10mL of Diluent in a rack.
5. Place the rack on the right side of the sampler and press GO. The air system pressurizes during the fluid wash procedure.
6. Read the air pressure on the air pressure gauge following the sample cycle. The air pressure should be between 5.0 ± 0.5 psi.
7. If the air pressure needs to be adjusted, proceed with the following steps:
 - a. Start the Service Application.
 - b. Under the **SPA Calibration**, adjust the value **cal [14]: pressure setting**. If the air pressure is too high, decrease the pressure setting value by one step at the time (2 Hex = 1 psi.)
 - c. Repeat steps 4 through 6 until the air pressure reading on the gauge is within the acceptable range.
8. Process several samples after the adjustment has been made:
 - a. When the pipette descends into a sample tube, the pipette releases a single large bolus of air. The sample will shoot up inside the tube to about 1 cm from the top of the tube.
 - b. If the sample overflows the top of the tube, decrease the air pressure.
9. Acceptance criteria:
 - a. Air pressure: 5.0 ± 0.5 psi.

4. Adjustments

Barcode Reader Alignment



NOTE: The light beam from the Barcode Reader is of low intensity and usually difficult to see. Reducing the ambient light will increase the visibility of the beam.

Material Required

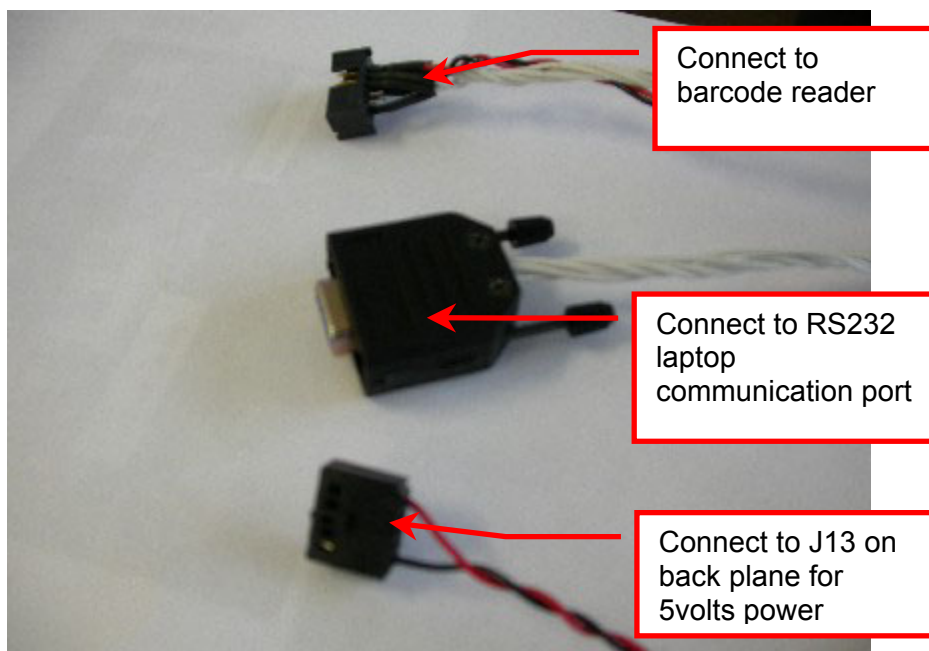
Routine Rack
16 x 100 mm glass test tube
Barcode reader alignment tool PN 725-3090
Barcode reader Y cable PN 250-3084
Barcode Reader Field Software PN 700-3110

Procedure

Make sure the Sampler Calibration has been performed.

Prepare Barcode Reader Connections

1. Turn the iQ200 microscopy unit off.
2. Remove the Lower Front Panel assembly.
3. Use the Barcode Reader “Y” cable (*IRIS part# 250-3084*) for RS232 and 5 VDC power connection to the Barcode Reader.

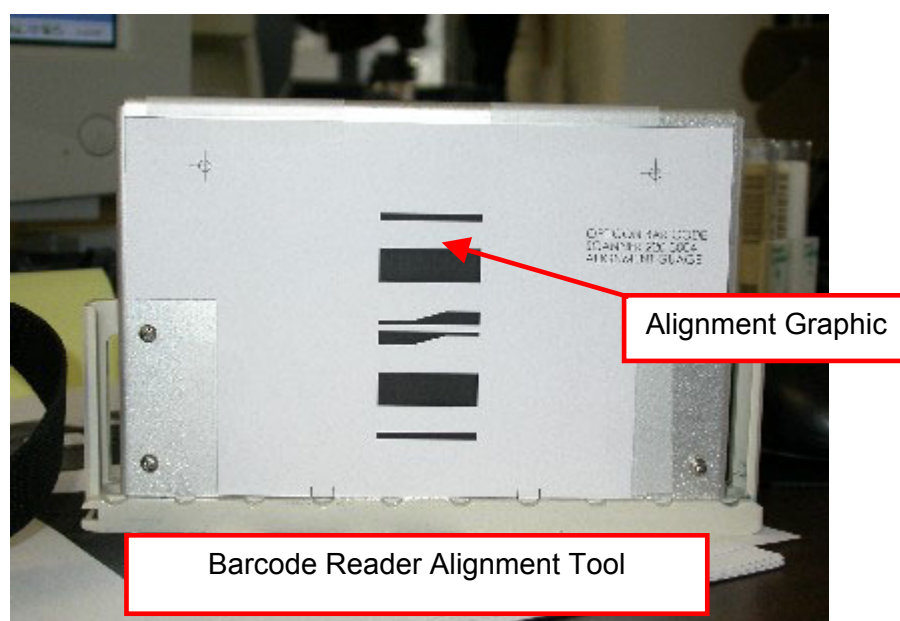


4. Adjustments

4. Connect the permanent cable from the Barcode reader to the female receptacle on the “Y” cable for the alignment.
5. Connect the J13 connector on the “Y” cable to J13 on the Backplane. Do not force the J13 connector, it is keyed to go in one way.
6. Turn on the iQ200 to power up the barcode scanner.
7. Connect the RS 232 cable to the communication port of the laptop.

Load the Alignment Tool

1. Load the “Barcode Reader Alignment Tool” (*IRIS part# 725-3090*) like a normal rack in the iQ200 sampler.

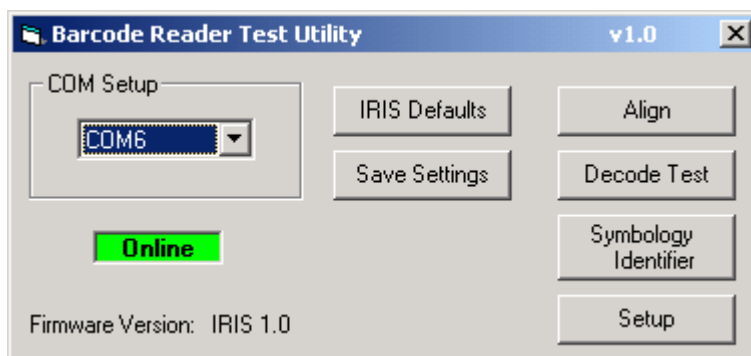


2. Start the Service Application.
3. From the Service Application, click on **STM**, then **Sequences**.
4. Double-click on **Initialize Rack M1** and then click **OK**.
5. Double-click on **Move Next MN** and then click **OK** until the rack is positioned at the fifth position.
6. Leave the Alignment tool in the fifth (5th) position.

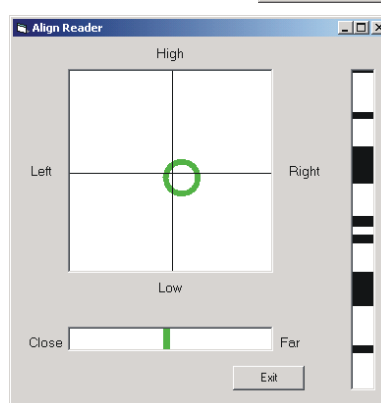
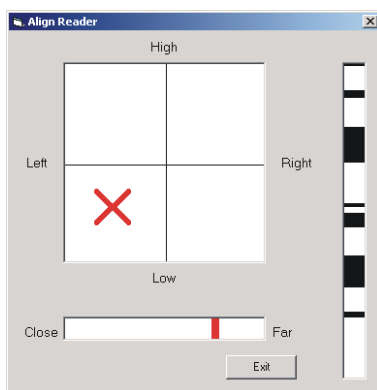
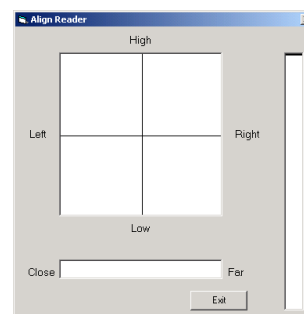
Perform barcode alignment

1. Start the “Barcode Utility Program” from the Laptop computer.
2. Use the COM Setup drop down menu on the main screen to select an open COM port (probably COM1 on a laptop) in order to establish communication between the Barcode reader and the laptop. The main screen view should display “Online” if the connection is successful.

4. Adjustments

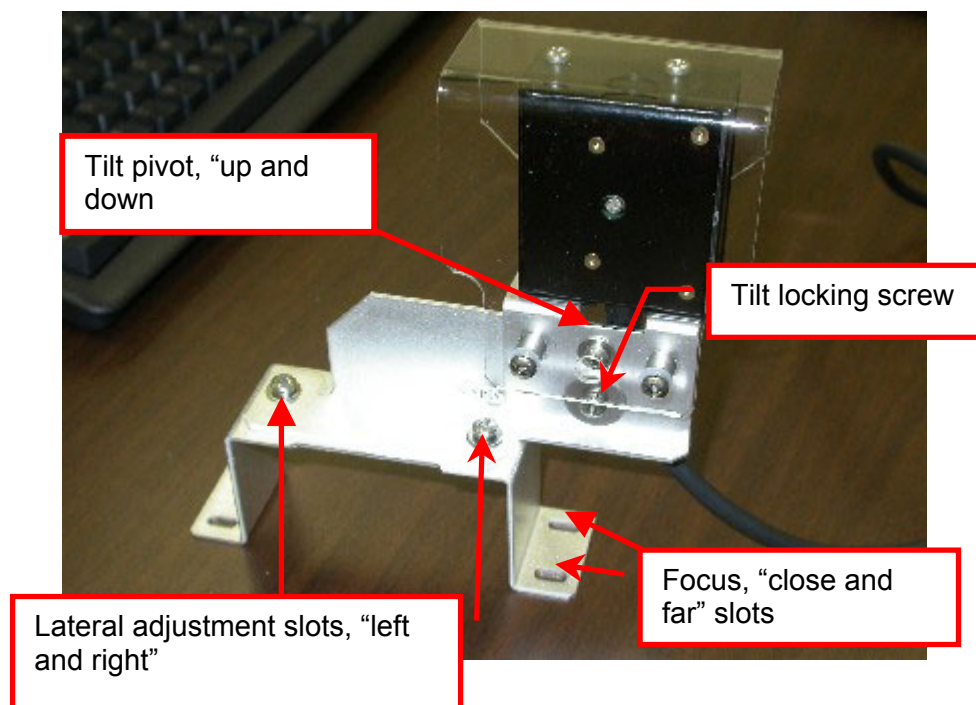


3. Click the “**Align**” button to perform the Barcode Scanner alignment. The screen on the right will be displayed.
4. The screen will probably be like one of the next two views:
 - Red is way out of alignment
 - Green is close to being aligned



If the indicator is positioned	The barcode reader
HIGH	Needs to be aimed lower
LOW	Needs to be aimed higher
LEFT	Needs to move to the right
RIGHT	Needs to move to the left
CLOSE	Is to close
FAR	Is to far

4. Adjustments



5. Move the reader until the green circle is perfectly centered on the cross hairs, and the distance bar is centered and green. Tighten all the screws to hold the readers position when it is aligned.
6. Install the Lower Front Panel assembly. Ensure that the "Barcode Utility Program" Alignment screen is still the same. There should be no change in the alignment on the screen.
7. Click the Exit button when the alignment is completed and the reader is aligned.
8. Close the "Barcode Utility Program".
9. Ensure that all of the alignment and mounting screws are tight.
10. Turn off the iQ200 power.
11. Remove the "Y" Cable.
12. Plug the cable from the reader into J13 on the Backplane. Do not force the J13 connector it is keyed to go in one way (key is facing down for proper orientation).
13. Exit the Service Application.
14. Restart the entire iQ200 system.

4. Adjustments

Validation

1. To ensure the barcode reader is reading and the system is working, load an iQ200 control rack with properly labeled tubes to perform Prime (first three tubes), Focus (5th tube) and Positive / Negative QC (6th and 7th tube). Check the results to be sure that the system is working properly.
2. Load a rack with tubes labeled with the customers labels filled with any material (focus, positive control, diluent, tap water etc.) Run the rack on the iQ200 system and check the results in the Work list to be sure that all labels read properly. If connected to an AX-4280, run the sample rack on both analyzers, and make sure that chemistry and microscopy results are attached.
3. If the system performs properly, the procedure is complete
4. If the barcodes do not read properly, recheck the alignment (it will be necessary to reinstall the "y" cable and hook up the laptop again to do so).

4. Adjustments

Collimation

What is a Collimation?

Collimation is the adjustment of the alignment of each optical element with regard to the others. The collimation is a way of improving considerably the optical performance. No high-resolution result can be obtained without an near perfect collimation, since image processing is incapable of compensating for the damages caused by a misalignment.

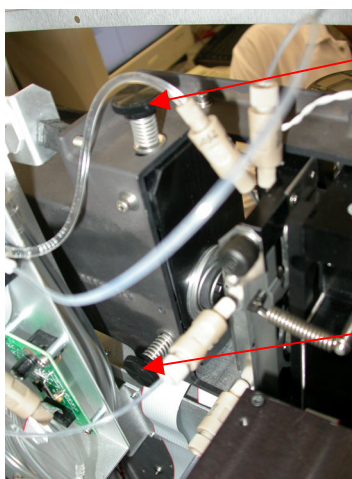
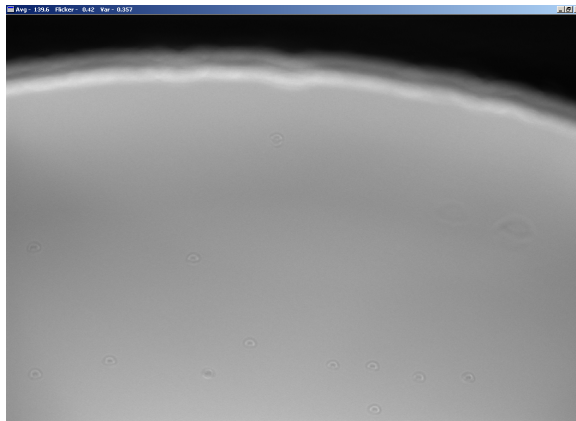
Condenser Alignment

1. Open the **Service** application.
2. From the **Service** application, click on **View** then **Video** to display the live video.
3. In Video View, the Avg light should be about 210 and the Var. should be lower than .035.



4. Adjustments

4. Turn the vertical knob clockwise to reach one edge of iris.



Vertical
adjustment

Horizontal
adjustment

5. Turn the vertical adjustment knob counter clockwise to the other edge of the iris.
6. Adjust the vertical knob until the condenser is centered.
7. Repeat above steps with the horizontal knob until the image is centered.
8. Close the Live Video window.
9. Exit the Service Application.

Run Auto Focus

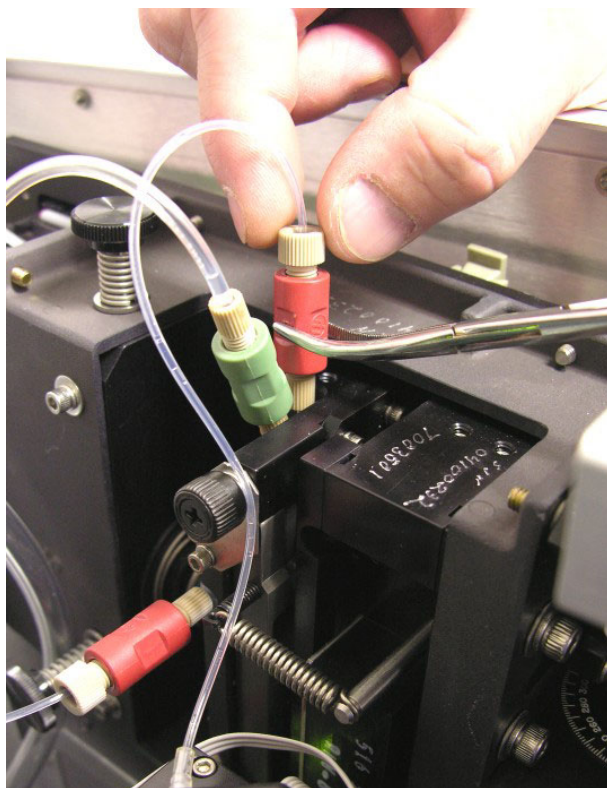
Run one glass tube with barcode label filled with 6mL of Focus in position 5 of a QC rack.

4. Adjustments

Flow Cell Replacement

Flow Cell Removal

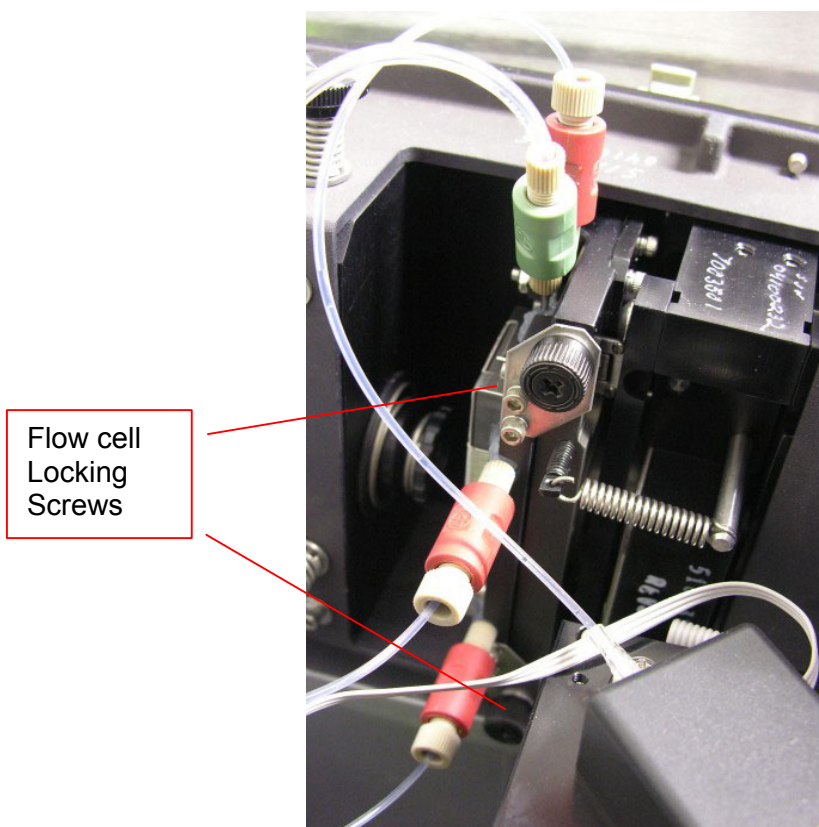
1. Disconnect the four tube assemblies connected to the flow cell by unscrewing the fittings.



CAUTION: Use caution when removing tubing from the flow cell. A hemostat must be used to stabilize the fitting during removal. The stainless steel cannulas are very fragile and any damage to the cannulas will destroy the flow cell.

4. Adjustments

2. Loosen the two locking screws located on the side of the flow cell.



3. Remove the flow cell from the Optical Bench Assembly.
4. Using a syringe, flush the flow cell with deionized water and recap.

Flow Cell Installation

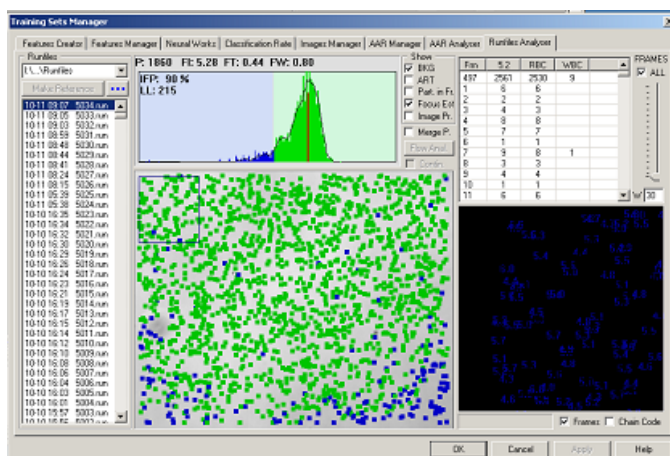
1. Connect the four tube assemblies to the flow cell.
2. Slide the flow cell into the mount, and then tighten the two locking screws.



4. Adjustments

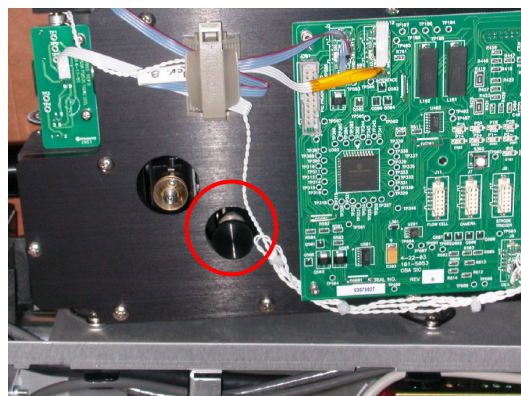
Flow Cell Lateral Adjustment

1. Place one glass tube in position 1 of a routine rack. Fill the tube with 3 mL of positive control. Do not apply barcode labels on the tube.
2. Place the rack on the right side of the sampler and press GO.
3. Press the Windows key on the keyboard.
4. Select **Program – Accessories - Window Explorer**.
5. Select **C: - Iris2k1 – Bin**. Double-click on **Runfile Analyzer** file.
6. Select the following options:
 - Show Part in Fr (particles in frame)
 - Focus Est (focus estimator)
 - Frame - ALL
7. Preview the runfile to evaluate the cell distribution on the screen.
8. Below is an example of the image you should see of a correct lateral adjustment.



NOTE: If the flow cell is not properly aligned, you will see an area within the field that will NOT display any cells.

9. If a lateral alignment is needed, use the knob highlighted on the right.

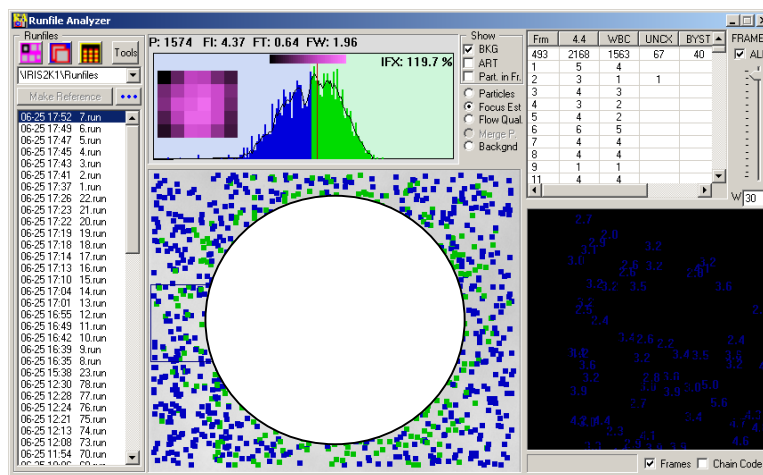


4. Adjustments

Flow Cell Tilt Adjustment

Make sure the Service Application software is closed before starting this procedure

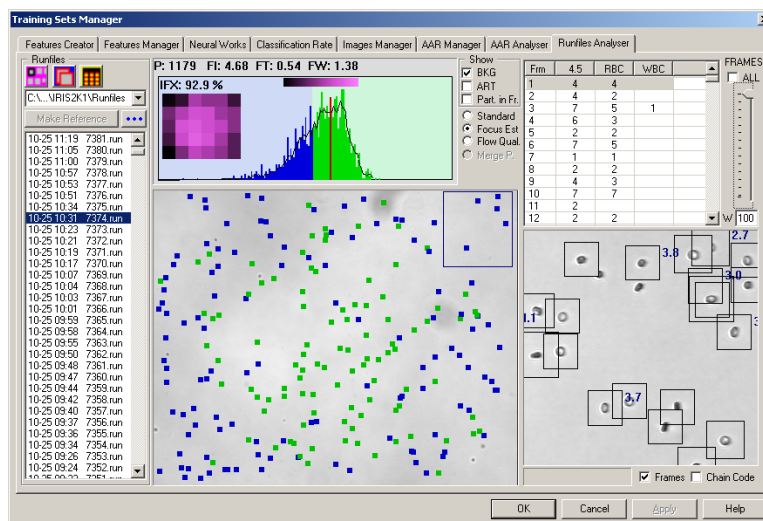
1. Press the Windows key on the keyboard.
2. Select **Program – Accessories - Window Explorer**.
3. Select **C: - Iris2k1 – Bin**. Double-click on **Runfile Analyzer** file.
4. Select the following options:
 - Show Part in Fr (particles in frame)
 - Focus Est (focus estimator)
 - Frame - ALL
5. Load a sample rack with **10 glass tubes**. Fill each tube with 3 mL of positive control. Do not apply barcode labels on the tubes.
6. Place the rack on the sampler and press the Start button.
7. When a tube run is completed, click on the Refresh button.
8. Select the new run results.
9. In order to determine if the tilt of the flow cell needs to be adjusted you will need get the focus at the highest FI possible and then move the flow cell farther away from the camera / objective by moving the focus motor in the positive direction.
10. Below is an example of the image you should see of a correctly adjusted flow stream tilt to the optical bench. A properly tilted flow cell will show the green dots form a circle that is centered in the camera view.



4. Adjustments

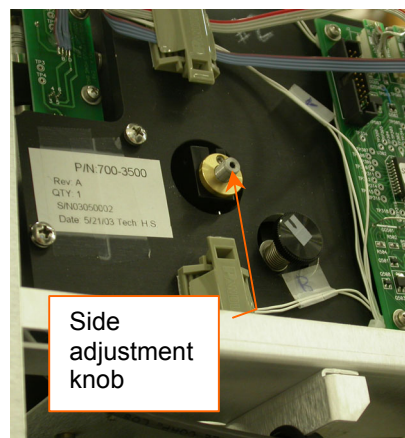
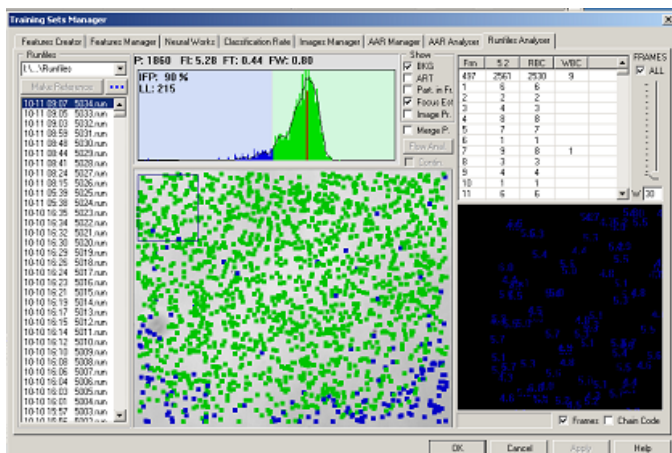
11. Upper right corner:

You will need to qualitatively evaluate the “halos” of each corner of the same run file to determine if the field curvature is the same from each corner of the camera field of view.



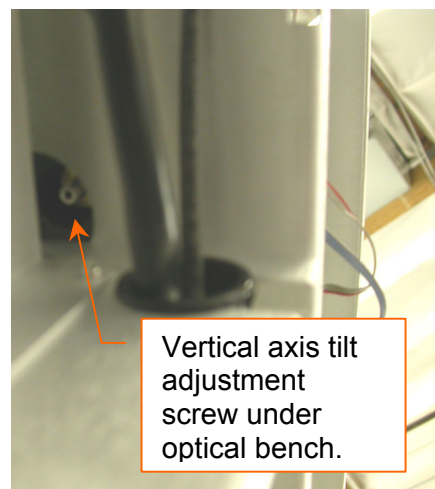
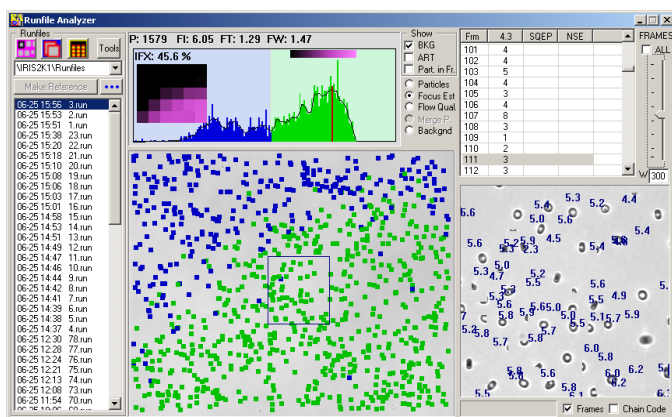
12. The example below shows a flow cell that needs more extreme tilt adjustment. Note the blue dots on the lower edge of the flow stream. This represents the left side of the flow cell.

13. When the blue dots appear at the **bottom**, adjust the side adjustment screw counter clockwise. When the FI is on the light side of focus, the field curvature will begin to show if your tilt is correct.



4. Adjustments

14. When blue dots appear at **top** and on the **left** corner you will need to adjust the Vertical tilt adjustment screw counter clockwise to correct this type of tilt and the Side adjustment screw clockwise.



15. When the tilt adjustment is complete, run a Focus tube.
16. After the Focus passes, run a Calibration rack.
17. After the Calibration rack passes, run a Control Rack.

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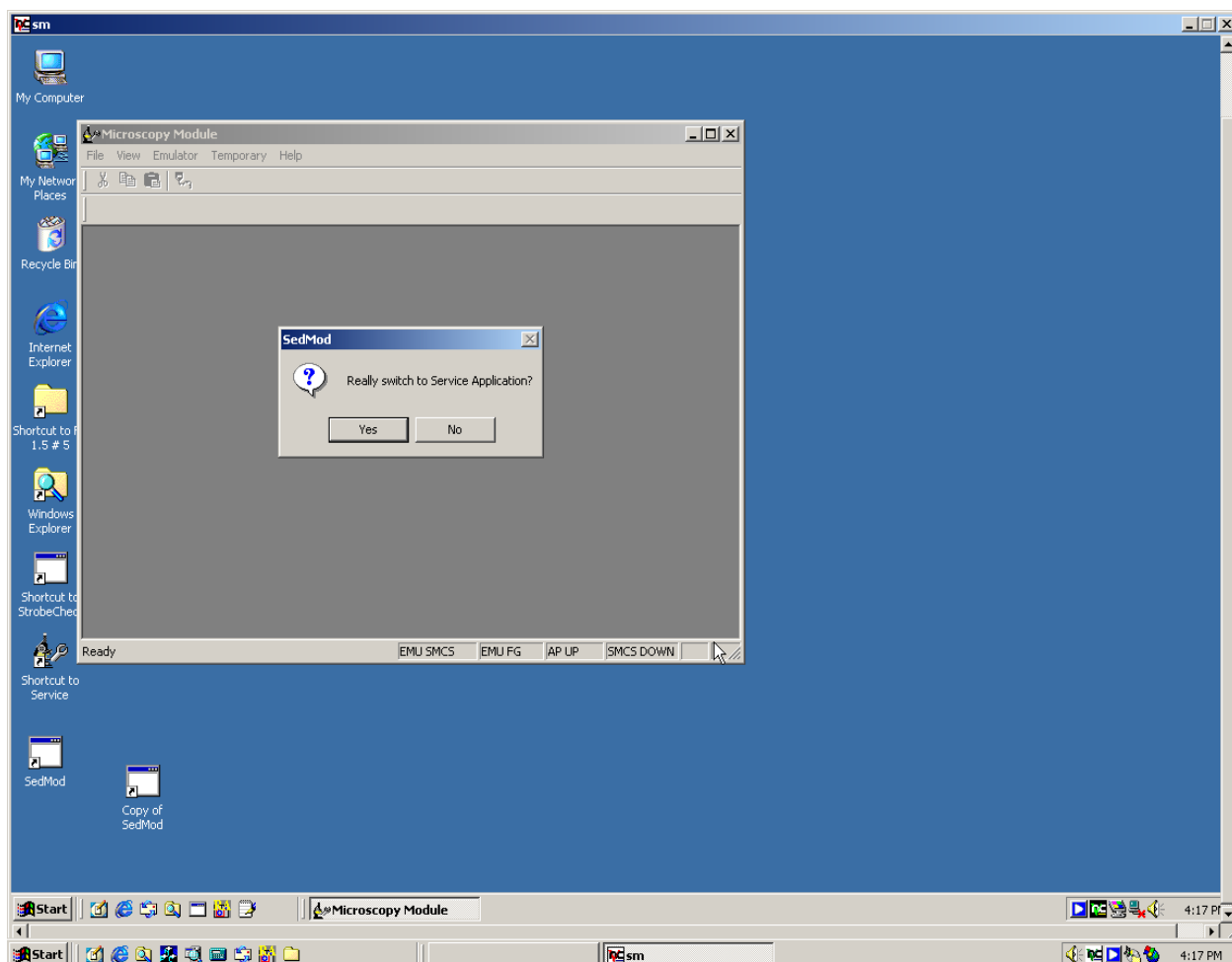
5. Service Application Software

Accessing the Service Screen

Startup

Press the Windows key on the keyboard (located between Ctrl and Alt keys). The Windows toolbar will be displayed at the bottom of the screen.

On the tool bar, left click on SM. The screen will display the SM screen. Select **File** – **Switch to Service Application**.

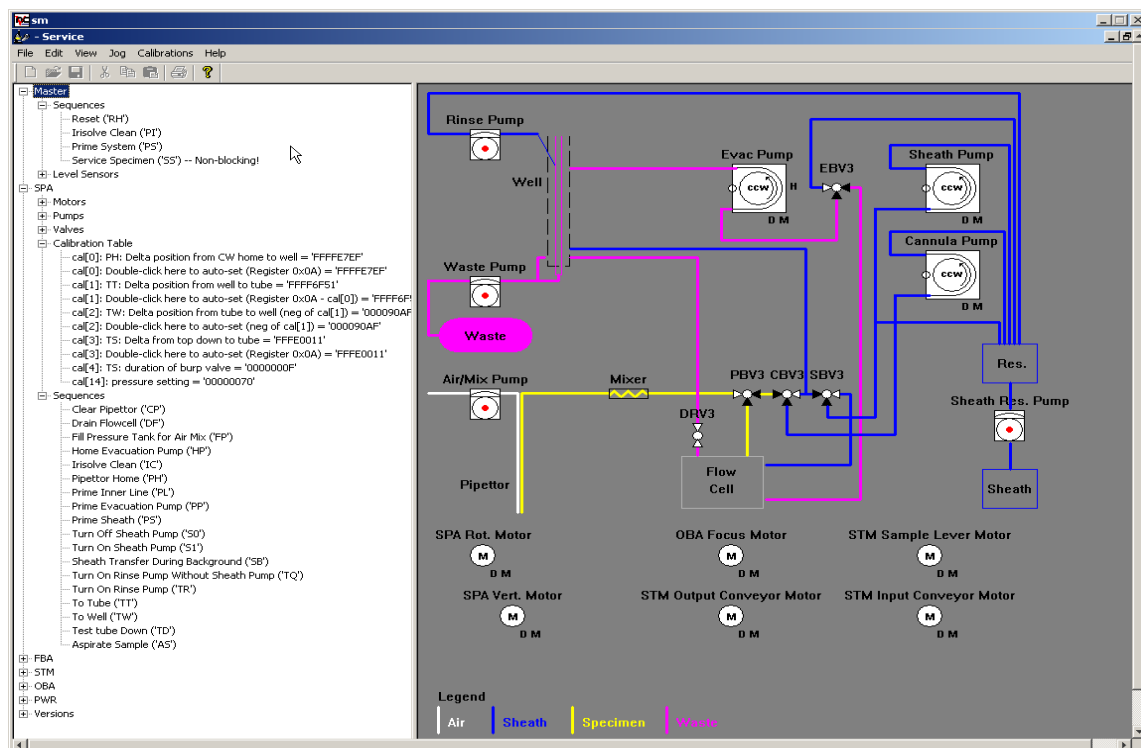


Select **Yes** to switch to Service Application. The system will prompt to switch off the Microscopy Module. When connections are established with the Results Processor, the system will prompt to turn the Microscopy Module back on.



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The **Service Screen** will be displayed.



The main screen is divided into two panes, the **Tree View Pane** and the **Fluid Schematic Pane**, with a **Menu Bar** across the top and a **Status Bar** across the bottom.

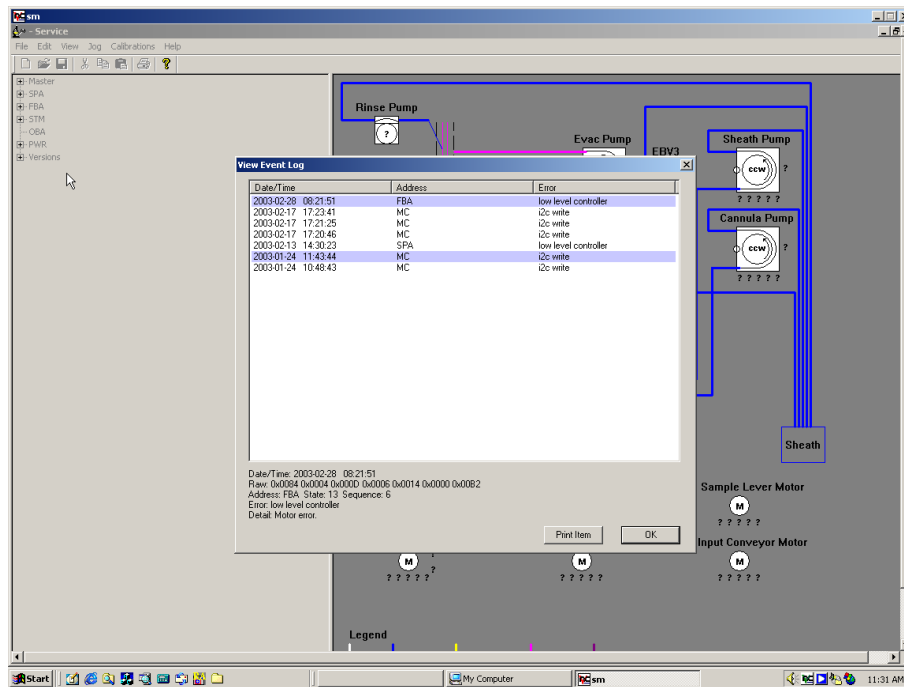
Establishing Link

When the Service program first starts up, it must establish a link with the analyzer control system. During this period, both the Tree View Pane and the Fluid Schematic Pane are disabled, as well as many menu items. The status of the link is shown in the status bar at the bottom of the screen.



Tip: While waiting for the connection to be established, you may want to review the Event log. Using the mouse, select **File, View Event Log**.

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Live Operation

Once the link has been established, the Service program commences live operation, during which the Tree View Pane and the Fluid Schematic Pane are enabled, as well as the majority of the menu items.

At this point, you may examine sensor values, send motor commands, run sequences, etc. See [Tree View Pane](#), [Fluid Schematic Pane](#) and [Menu Bar](#) for further information.

Tree View Pane

The Tree View Pane provides a hierarchical view of the system. Individual nodes of the tree control may be expanded or collapsed similar to other tree controls found in many Windows™ programs.



Tip: To reduce screen clutter, expand only the parts of the tree pertaining to what you are working on.

Some of the items contained in the tree are also contained in the Fluid Schematic Pane, but the tree contains many more. Types of items found in the tree:

- Commands
- Preset Moves
- Sensors
- Calibration Table
- Sequences

5. Service Application Software

Commands

If you double-click on a command, you will be asked to confirm the command. Some commands (typically labeled with the word “set”) request additional data (e.g., “set move velocity” requests the velocity to be set). Commands are one of the low-level building blocks of the control system. You can execute multiple commands simultaneously, but there is typically no reason to do so. **Use Commands to test very low-level aspects of the instrument, such as whether a sensor is responding.**



Tip: To use a *move* command, **always** set the velocity and delta position before executing the move, **unless** the last thing you did was execute the same move. Otherwise, the move will be executed using the last velocity and delta, which might not be what you expect.

Preset Moves

If you double-click on a preset move, you will be asked to confirm whether you would like to execute the preset move. Preset moves are specific commands used by the instrument’s sequences (e.g., the SPA has a preset move to move the rotational motor from the waste well to the specimen tube position). In all other respects, preset moves are just like commands.



Tip: Preset moves often are meant to be executed from some particular position. The starting position is usually indicated in the label (e.g., “move from well to tube”). Make sure you satisfy the starting condition before executing the preset move.

Sensors

If you double-click on a sensor its value will be updated more quickly. Once updated, it will return to the normal update rate. See [Polling](#). Sensors are updated via commands, so they can be executed simultaneously with other commands. Digital sensors are displayed with either a ‘1’ or a ‘0’, indicating True/False, Blocked/Not Blocked, Enabled/Not Enabled, etc. Analog sensors display the hexadecimal value (e.g., ‘64’, which is $6 \times 16 + 4 = 100$ decimal). In some cases (e.g., STM’s tube detector) both the digital value and the analog value are displayed.



Tip: If the sensor displays a question mark (?) its value has not been determined. When the Service program first starts, all sensors display question marks. If the question marks persist for a particular sensor it is probably an indication of a problem with the associated micro controller.

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Register 0x0A

The sensor labeled “Register 0x0A” is a special sensor only found on motors. When the motor is sent home the control system updates register 0x0A to reflect the distance it had to move to get to home, effectively measuring the last position. This is useful when setting some calibration table entries.

Calibration Table

Calibration Auto-Sets

In some cases there is more than one item in the tree for a given calibration table entry. In such cases, the second entry provides a more convenient way to set the value. The label indicates what the shortcut will do; double-click on the shortcut to perform the action. For example, “cal[1]: Double-click here to auto-set (Register 0x0A - cal[0])” will set calibration table entry 1 to the difference of register 0x0A and calibration table entry 0. See [Register 0x0A](#).

Sequences

If you double-click on a sequence you will be asked to confirm whether you would like to run the sequence. Sequences correspond to the sequences of commands used in the control system to perform major operations on the instrument, such as the STM’s M1 sequence, which advances a rack to the initial position. The program does not let anything else run while a sequence is running, although it does allow other commands, sequences, etc., to be queued (e.g., if you start the STM’s M1 sequence, the program will let you queue up the MN sequence or the home command, but neither one will actually be run until the M1 sequence completes).

5. Service Application Software

Fluid Schematic Pane

The Fluid Schematic pane provides a schematic view of the fluid system as well as the other motors not directly related to the fluidics in the analyzer.



Tip: The schematic shows a logical layout; this layout in many cases does not correspond to the actual physical layout. The logical layout is meant to facilitate understanding the system: it is not meant as a picture atlas to familiarize technicians with machine layout.

The Fluid Schematic shows:

- [Diaphragm Pumps](#)
- [Peristaltic Pumps](#)
- [3-Way Valves](#)
- [2-Way Valves](#)
- [Motors](#)
- [Tube Connectors](#)
- Other Regions of Interest

Diaphragm Pumps

Diaphragm pumps are shown in one of three states:

- *Question mark ('?')* – status of the pump is not known.
- *Red dot* – pump is not activated.
- *Green dot* – pump is activated.

Double-clicking on a diaphragm pump image offers to toggle its activation (i.e., turn it on or off).

Peristaltic Pumps

Peristaltic pumps are shown with a graphic indicating which direction is counter-clockwise. Moving any pump forward or positive moves clockwise; backward or negative is counter clockwise.

By design, double-clicking on a peristaltic pump image has no effect in order to make it more difficult to accidentally run the pump. Accidentally running a peristaltic pump could damage the analyzer.

The peristaltic pump is shown surrounded by sensor values. If a sensor is inactive, no value is shown. If a sensor is active, it shows a corresponding letter:

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- *B* – Busy. The motor is in motion.
- *E* – Error. A motor error has been detected.
- *S* – Stall. Position error exceeded specified limits.
- *D* – Done. Motor has reached target position.
- *M* – Motor Off. Drive output is off.
- *H* – Home. The home sensor is blocked. **Tip:** After successfully executing a motor home command, the motor position is moved slightly off the sensor, so the home sensor is almost never active after going home! If you suspect problems homing a motor, try blocking and unblocking its home sensor to make sure the sensor is working.



Tip: Be careful moving peristaltic pumps! Double check direction and valve settings to prevent over-pressuring the system!

3-Way Valves

3-Way valves are shown in one of three states:

- *Question mark ('?')* – status of the valve is not known.
- Otherwise, blackened ports indicate the path fluid may take.

Double-clicking on a valve image offers to toggle the valve.

2-Way Valves

2-Way valves are shown in one of three states (yes, three):

- *Question mark ('?')* – status of the valve is not known.
- *Ports blackened* – fluid may flow through the valve.
- *Ports whitened* – fluid *may not* flow through the valve.

Double-clicking on a valve image offers to toggle the valve.

Motors

Motors are shown surrounded by sensor values. . If a sensor is inactive, no value is shown. If a sensor is active, it shows a corresponding letter:

- *B* – Busy. The motor is in motion.
- *E* – Error. A motor error has been detected.
- *S* – Stall. Position error exceeded specified limits.
- *D* – Done. Motor has reached target position.
- *M* – Motor Energized. Drive output is enabled.



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- *H* – Home. A home sensor is blocked. **Tip:** After successfully executing a motor home command, the motor position is moved slightly off the sensor, so the home sensor is almost never active after going home! If you suspect problems homing a motor, try blocking and unblocking its home sensor to make sure the sensor is working. Motors may have from zero to two home sensors.

Double-clicking on a motor image will offer to move or home the motor, depending on the motor.

Tube Connectors



Colored lines representing tube connections connect various parts of the fluid schematic. The fluid schematic color-codes the connections to represent their general usage (e.g., the line going through the Air/Mix Pump is white to denote air).

Tip: there is a legend at the bottom of the screen describing the colors.

Other Regions of Interest

The fluid schematic displays other regions of interest to provide orientation as to the purpose and logical location of various elements. For instance, the Well is shown even though it has no controls of its own.

Menu Bar

File Menu

View Event Log

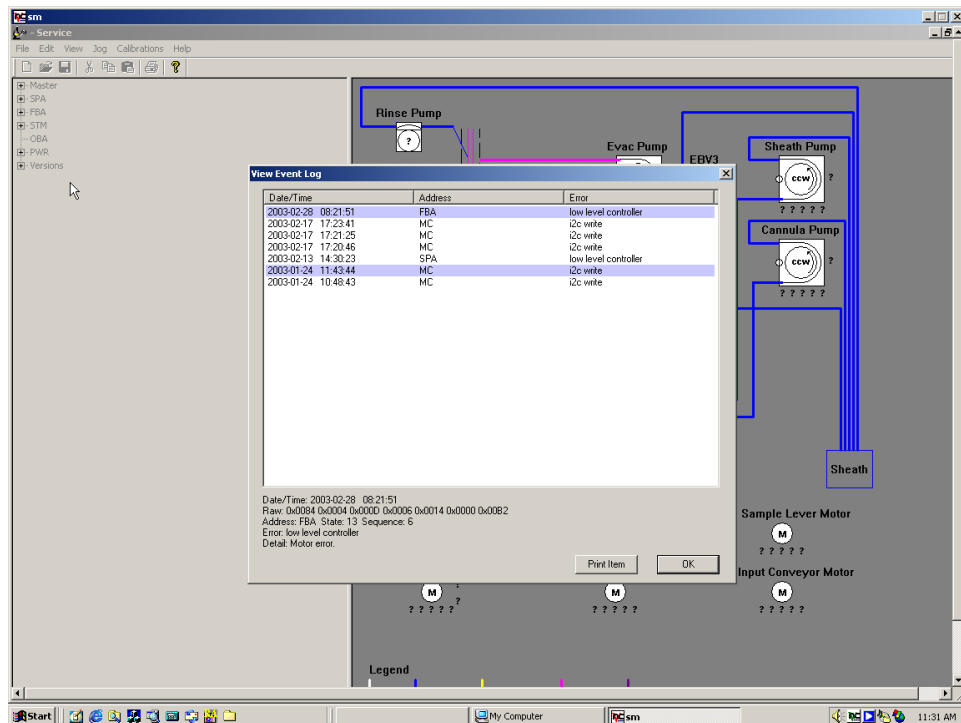
Selecting this item displays the View Event Log dialog box. This shows a list of the events (usually errors of some kind) recorded on behalf of the analyzer control system, from most recent to least recent. Events are stored in a first-in, first-out storage scheme, so oldest events may be purged from the system, but the storage should be sufficient to troubleshoot current problems.

The bottom of the View Event Log dialog box shows details of the selected event. When the box is first displayed, it shows details of the most recent event. Select other events to show their details. The selected event may be printed.

The address line identifies the point in the state records where the system halted. Chapter 8 contains the state records that can be used to locate problems.



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Show Versions Report

This command displays a list of the firmware versions in Internet Explorer. The list may be printed using the IE print command.

Exit

Selecting this item exits the Service program, closing any windows it might have opened, and restarts the main SM program (which is the program that should be running under normal circumstances).

Note: Do not shut down the SM application.



Edit Menu

The Edit menu has normal cut, copy and paste menu items (as well as undo), but they are only available when doing text entry in dialog boxes.

View Menu

Toolbar

Check this item to show the toolbar. Uncheck it to hide the toolbar.



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Status Bar

Check this item to show the status bar. Uncheck it to hide the status bar.

Polling

One of the following values can be chosen:

- *Off* – Turn polling off. When the current group of query messages completes, the link status will show “Idle” and remain there. Polling will not continue until something besides Polling: Off is chosen. Some menu items cannot be selected unless polling is turned off.
- *Slow* – Polling is turned on. There does not seem to be any difference between Slow, Medium and Fast.
- *Medium* – Polling is turned on. There does not seem to be any difference between Slow, Medium and Fast.
- *Fast* – Polling is turned on. There does not seem to be any difference between Slow, Medium and Fast.

Video

Selecting this item displays the live video window (ViewPXD), or brings it to the top if it is already being displayed.

Record Video Statistics

This command gets the video statistics from the live video window and appends them to a data file. If the live video window has not been started, this command starts it and pauses a few seconds, providing time for the live video window to initialize. The statistics – “Avg”, “Flicker” and “Var” – are appended to C:\iris2k1\reports\VideoStatistics.csv. Comma separated value files (.csv) are commonly used to exchange data with data manipulation applications such as Excel.

Terminal

Displays the Terminal window. This item is only enabled when the Polling is off and the link status is “Idle”.

The Terminal window consists of a scrolling list of message traffic between the Service program and the analyzer control system, an area in which to type new messages, a Send button to send the new message, and OK/Cancel buttons to close the Terminal window.

The Terminal Window, **an advanced feature**, allows messages to be typed in directly and their replies to be displayed.

Tip: The Terminal Window should only be used by very advanced users or under the direct supervision of very advanced users.



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Jog Menu

There are several items on the Jog menu. Selecting one of these items displays a Jog dialog box for the motor indicated. These items can only be selected after the communications link has been established.

A Jog dialog box consists of the following items:

- A title indicating which motor it controls.
- Velocity radio buttons to choose between Coarse and Fine velocity.
- Instructions indicating to hold down an arrow key to move and release the arrow key to stop.
- A graphic indicating whether the up/down or left/right arrow keys are used.
- A Home button to home the motor.
- An OK button to close the Jog dialog box.

Jog is usually used to position a motor for calibration. Position the motor as desired, then press the Home button so the position will be stored in Register 0x0A for the appropriate motor (each motor has its own in its Sensors section). Then use [Calibration Auto-Sets](#) to store the calibration value.



Tip: Jog response improves greatly if you turn Polling off!

Status Bar

The Status Bar has five status areas in the lower right of the display. From left to right:

- Current Message Status
- Link Status
- Caps Lock Status
- Num Lock Status
- Scroll Lock Status

Current Message Status

The current message status area of the status bar shows the message currently being processed. The Service application communicates with the instrument by sending it messages. Processing a message entails sending the message, waiting for the instrument to echo the message back, then waiting for the message reply (not all messages expect a reply, but many do). The message currently being processed is displayed in the current message status area. If no message is currently being



5. Service Application Software

processed, this area is blank. The Service application updates this area about once per second, so if messages are being processed quickly, some messages might not show up in the current message status. That is normal.



Tip: Under almost all circumstances the current message status can be ignored! *The only time it is important is if the Service application appears to hang.* In such cases, the exact text of the current message can help engineering investigate the problem. You can try restarting the system to see if the problem goes away.



Tip: Messages entered through the Terminal window don't get displayed in the current message status area.

Link Status

The link status area of the status bar shows the status of the communications link to the analyzer control system. Here are the possible statuses in chronological order:

- "Starting ASTM"
- "Establishing link (may take a minute)"
- "Could not establish link"
- "Connection established"
- "Sending initialization messages"
- "Sending initial query messages"
- "Sending query messages"
- "Idle"

"Starting ASTM"

During normal operation the analyzer control system communicates to the PC using the ASTM E1381 protocol, which provides high robustness at the cost of some sacrifice of bandwidth. The Service program must initially link using this protocol, so it starts an ASTM session.

"Establishing link (may take a minute)"

After starting the ASTM protocol, the Service program verifies the ASTM link. It then issues commands to the analyzer control system to switch the communications protocol from ASTM to a more or less raw serial protocol (gaining bandwidth at some sacrifice of robustness). Finally, it issues commands to the analyzer control system to put it into service mode.



5. Service Application Software



Tip: Certain types of errors detected by the analyzer control system during startup may cause the View Event Log dialog to pop up. In such cases the Service program will probably “be stuck” in the establishing link phase. The error reported by the View Event Log must be remedied to proceed. Remedy the error, restart the Service program and cycle the power on the analyzer.

“Could not establish link”

If any of the steps in “Establishing link (may take a minute)” fail, this message is displayed, along with one or more dialog boxes stating the link could not be established.

Troubleshooting Failure to Establish Link

In order of most likely to least likely:

Startup – Restart the Service program and cycle the analyzer power within a few seconds of each other. Starting up one or the other too late is the most common cause of failure to establish link. Sometimes a “glitch” in the startup of one or the other causes it to take longer to get going. In either case, restarting the Service program and cycling the analyzer power close together often results in a successful link.

Cable – Check the cable connecting the Sediment Module PC to the analyzer. There is only one serial port on the PC, but the analyzer has several: the cable should go to the top-most connector. Swap cables if necessary.

Analyzer Failure – If the analyzer startup process encounters an error it may not be able to start up its serial port properly. This might result in a red light on the analyzer front panel. Remove the left side panel to see if there are any lights on any of the boards in the cage.

Fuses – Double-check analyzer fuses, particularly F13.

20-Pin Ribbon Cable from Rear Panel SIC to J14 on Backplane – Check the cable connecting the rear panel SIC to the backplane.

HLCB – Swap the HLCB.

Rear Panel SIC – Swap the Rear Panel SIC.

“Connection established”

This status is briefly displayed after successfully establishing the connection.

5. Service Application Software

“Sending initialization messages”

This status indicates the initialization messages are being sent to the analyzer control system. This happens once, directly after establishing the connection.

“Sending initial query messages”

After sending the initialization messages, the Service program sends a group of initial query messages to read the value of things that don't change during machine operation (e.g., calibration table entries, firmware versions). This happens once, directly after sending the initialization messages.

“Sending query messages”

Directly after sending the initial query messages and periodically thereafter, the Service program sends query messages to read the value of things that might change during machine operation (e.g., sensors). The periodic polling can be turned off via the Polling menu.

“Idle”

This status is displayed during the brief interval between sending each periodic set of query messages. The periodic polling can be turned off via the Polling menu.

Caps Lock Status

Displays the status of the keyboard Caps Lock key. Not particularly useful, but many programs have this.

Num Lock Status

Displays the status of the keyboard Num Lock key. Not particularly useful, but many programs have this.

Scroll Lock Status

Displays the status of the keyboard Scroll Lock key. Not particularly useful, but many programs have this.

5. Service Application Software

Sequences & Sensor Identifications for Troubleshooting

Master (Master Controller)

Sequences

Reset (RH)

System Reset; can be used anytime to reset the microscopy module.

Service Specimen (SS)

Run one sample through the instrument by turning polling off and placing a sample tube with sample in position #1 of a sample rack. Used while viewing live video to manually focus the microscope.

Level sensors

	0	1	Sensor
Reservoir Overflow	Normal	Bottle overfilled	1
Reservoir not empty	Normal	Empty bottle	4
Reservoir not low	Normal	Bottle low	3
Reservoir full	Normal	Bottle not full	2

SPA

Fill Pressure Tank for Air Mix (FP)

Attempts to fill air tank to pressure cal value [14].

Pipettor Home (PH)

Resets SPA pipette to the home position.

To Tube (TT)

Moves pipette to the sampling position from home or well to test tube position.

To Well (TW)

Moves pipette to the waste well position. **Can only be used after Test tube down (TD)**

Test Tube Down (TD)

Moves pipette down into the tube. **Can only be used after To Tube (TT)**



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5. Service Application Software

Pumps/Evacuation pump/Sensors

Cassette in Place	0 = No cassette	1 = Cassette in place
Cover in place	0 = Cover open	1 = Cover closed

STM

Initialize Rack (M1)

Brings a rack forward and moves it to the initial position.

Move Next (MN)

Advances rack to the next tube position.

Read Barcode (BC)

Scans the barcode.

Clear Rack (CR)

Clears and ejects the specimen rack.

Sensors

Tube Detect	0 = No tube	1 = Tube present
Tube detect (raw)		Hex value of tube detector output
Barcode		Barcode read by scanner

FBA

Pumps/Sheath pump/Sensors

Cassette in Place	0 = No cassette	1 = Cassette in place
Cover in place	0 = Cover open	1 = Cover closed

Pumps/Cannula pump/Sensors

Cassette in Place	0 = No cassette	1 = Cassette in place
Cover in place	0 = Cover open	1 = Cover closed



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5. Service Application Software

Program Operation

Frequently Asked Questions (FAQ)

Why Does a Sensor Display the Wrong Value?

The Service program gets sensor values by polling the sensors periodically. It takes several seconds to poll all the sensors in the analyzer (actually, more like 10 seconds). After a very brief pause, we poll again, over and over (unless you turn Polling off). The sensor value is correct when it is read, but the true value might change between the last reading and present time.

There are two ways you can make sure the reading is current:

- Wait until the Link Status indicates “Idle” *twice*.
- Double-click on whichever one of the Sensors you want to update in the Tree View Pane (this usually causes the sensor to update within about one second).

Which Controller Does Component X (Pump, Valve, etc.) Belong To?

Pump	Type	Controller
Evacuation Pump (EP)	Peristaltic	SPA
Lamina Pump (SP)	Peristaltic	FBA
Cannula Pump (CP)	Peristaltic	FBA
Fill Pump	Diaphragm	FBA
Waste Pump	Diaphragm	FBA
Air/Mix Pump	Diaphragm	FBA
All Valves	3-Way, 2-Way	SPA

5. Service Application Software

What Are the Communication Addresses of the Major System Components?

Component	Communication Address
Master Controller (MC, MST)	N/A
SPA	82
FBA	84
STM	86
OBA	88

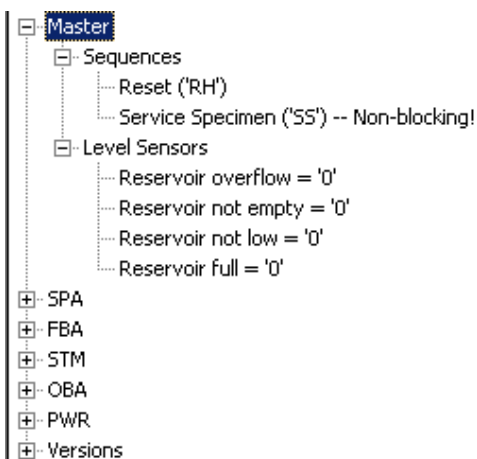
What Should I Do If the Service Application Appears to Hang?

The most likely cause would be diagnosed with the Current Message Status indicator. See that section for details.

5. Service Application Software

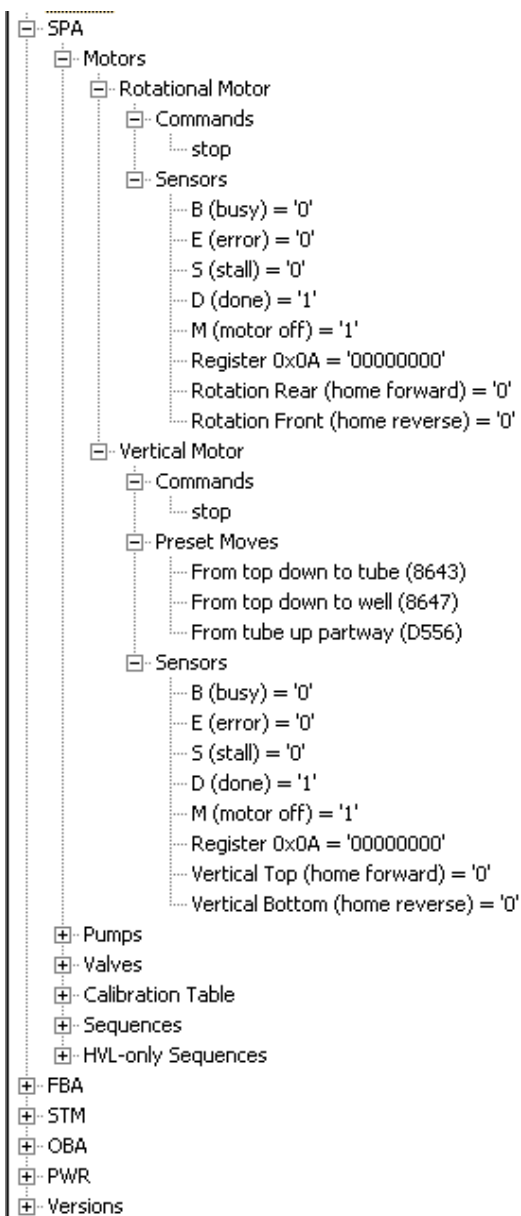
Service Tree

Master



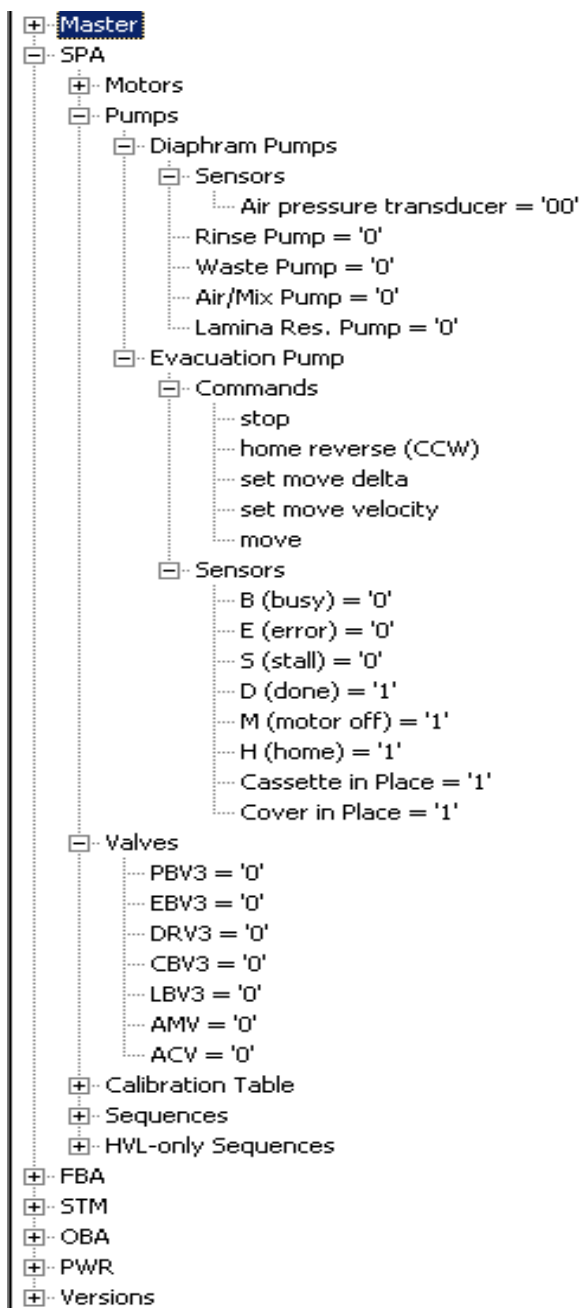
5. Service Application Software

SPA Motors



5. Service Application Software

SPA Pumps and Valves



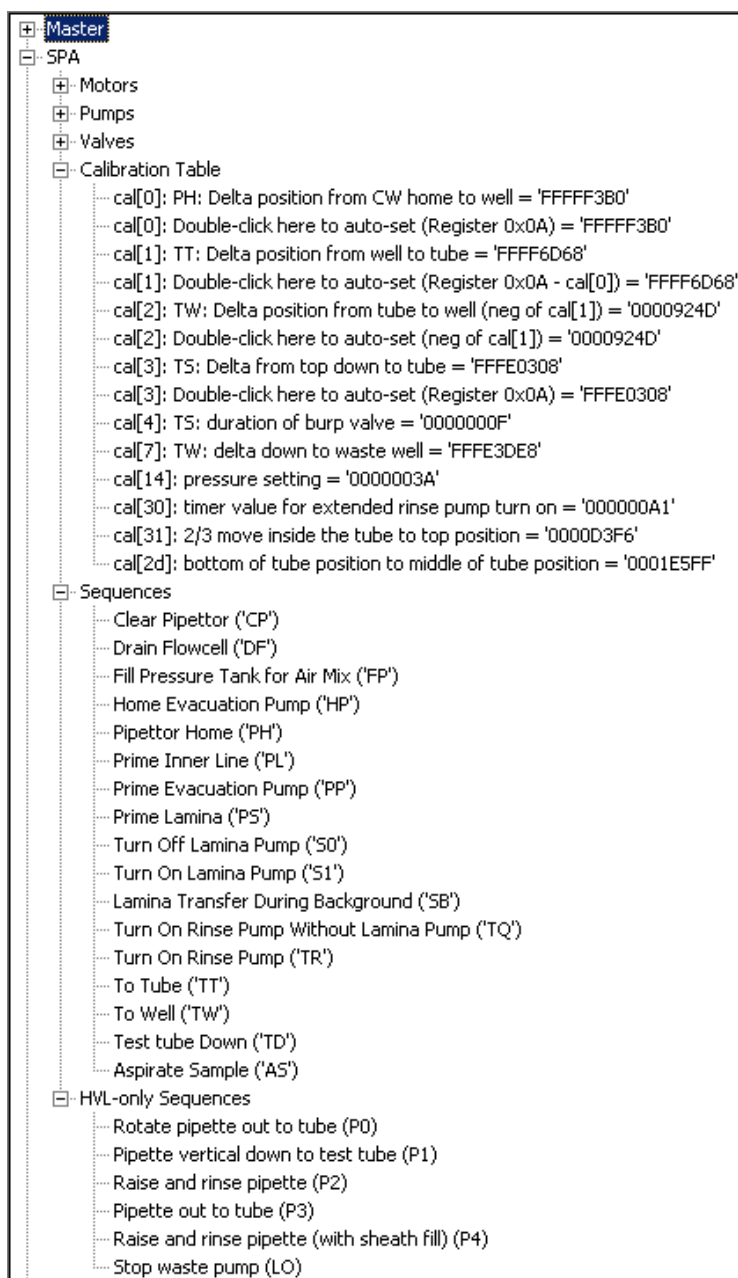
5. Service Application Software

SPA Calibration Table and Sequences

+	Master
+	SPA
+	Motors
+	Pumps
+	Valves
+	Calibration Table
...	cal[0]: PH: Delta position from CW home to well = 'FFFFFF2EC'
...	cal[0]: Double-click here to auto-set (Register 0x0A) = 'FFFFFF2EC'
...	cal[1]: TT: Delta position from well to tube = 'FFFF6CD5'
...	cal[1]: Double-click here to auto-set (Register 0x0A - cal[0]) = 'FFFF6CD5'
...	cal[2]: TW: Delta position from tube to well (neg of cal[1]) = '0000932B'
...	cal[2]: Double-click here to auto-set (neg of cal[1]) = '0000932B'
...	cal[3]: TS: Delta from top down to tube = 'FFFE0354'
...	cal[3]: Double-click here to auto-set (Register 0x0A) = 'FFFE0354'
...	cal[4]: TS: duration of burp valve = '0000000F'
...	cal[7]: TW: delta down to waste well = 'FFFE3DE8'
...	cal[14]: pressure setting = '0000003A'
...	cal[31]: 2/3 move inside the tube to top position = '0000D511'
...	cal[2d]: bottom of tube position to middle of tube position = '0001E5'
+	Sequences
...	Clear Pipettor ('CP')
...	Drain Flowcell ('DF')
...	Fill Pressure Tank for Air Mix ('FP')
...	Home Evacuation Pump ('HP')
...	Pipettor Home ('PH')
...	Prime Inner Line ('PL')
...	Prime Evacuation Pump ('PP')
...	Prime Lamina ('PS')
...	Turn Off Lamina Pump ('S0')
...	Turn On Lamina Pump ('S1')
...	Lamina Transfer During Background ('SB')
...	Turn On Rinse Pump Without Lamina Pump ('TQ')
...	Turn On Rinse Pump ('TR')
...	To Tube ('TT')
...	To Well ('TW')
...	Test tube Down ('TD')
...	Aspirate Sample ('AS')
+	HVL-only Sequences
...	Rotate pipette out to tube (P0)
...	Pipette vertical down to test tube (P1)
...	Raise and rinse pipette (P2)
...	Pipette out to tube (P3)
...	Raise and rinse pipette (with sheath fill) (P4)
...	Stop waste pump (LO)

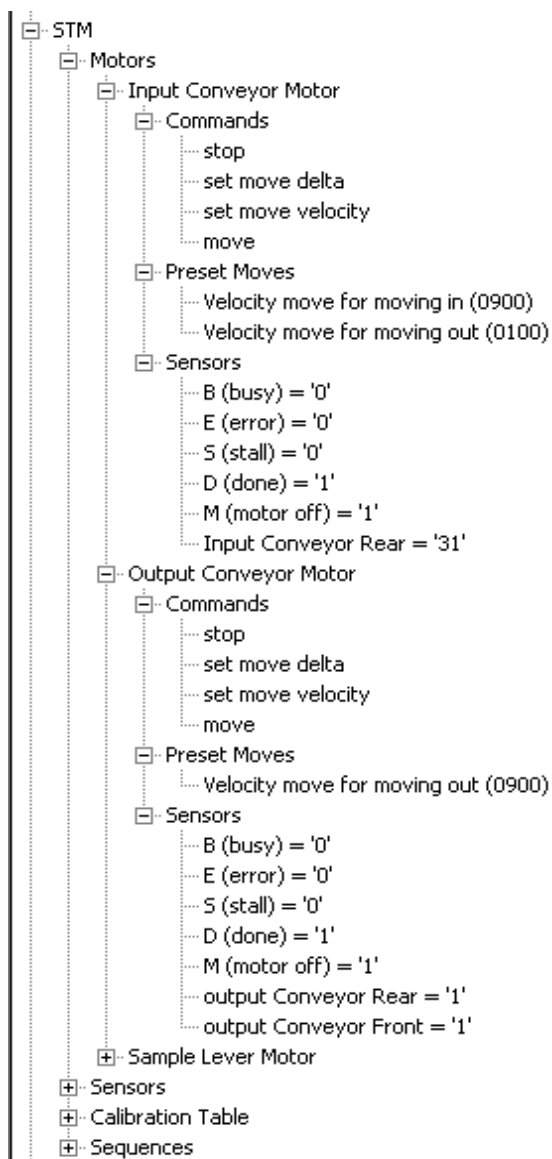
5. Service Application Software

FBA Pumps and Sequences



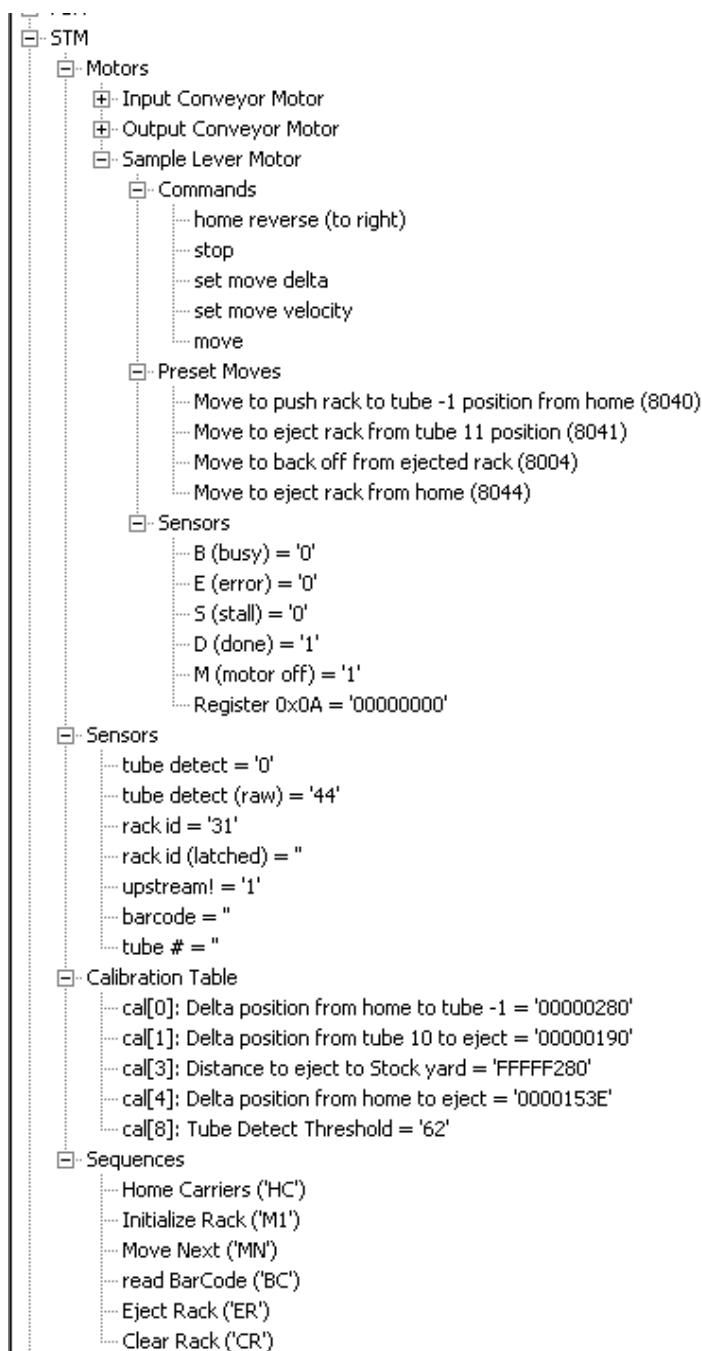
5. Service Application Software

STM Motors 1



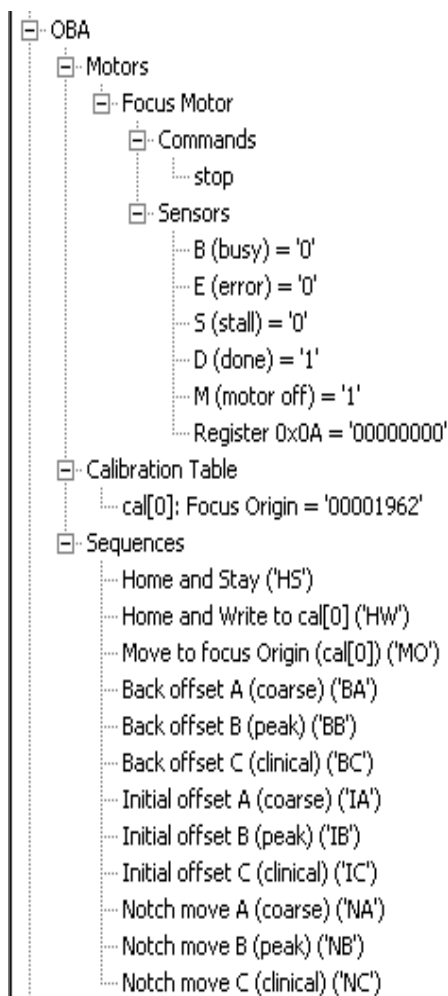
5. Service Application Software

STM Motors 2, Sensors, Calibration Table and Sequences



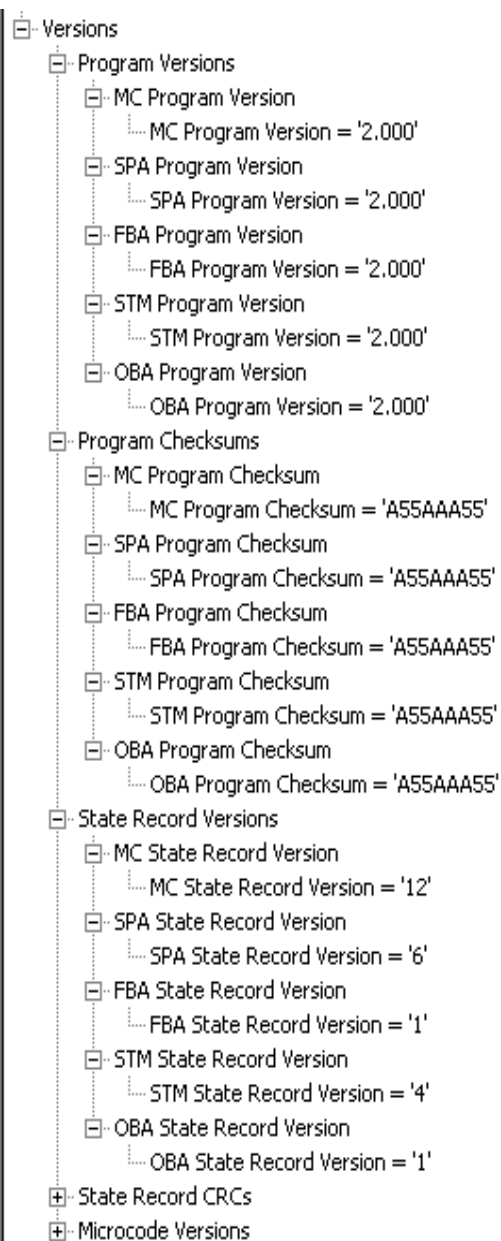
5. Service Application Software

OBA



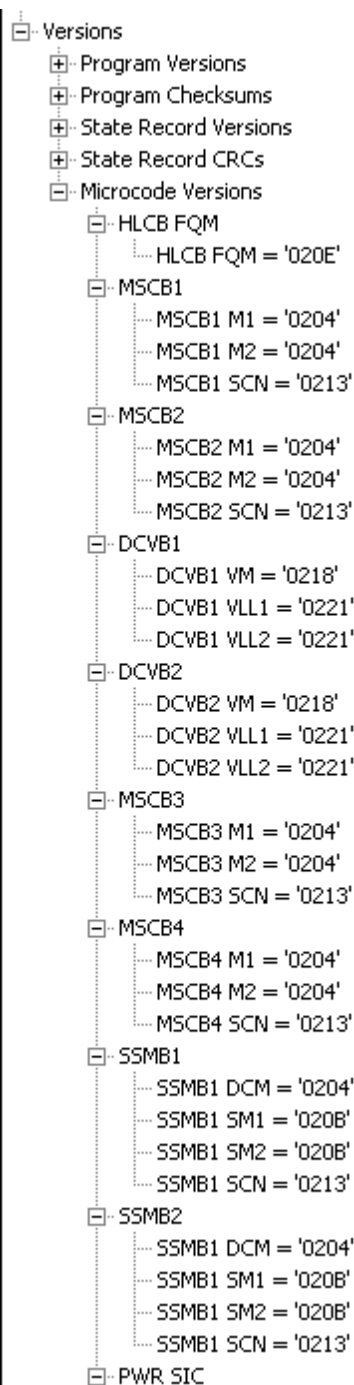
5. Service Application Software

Versions 1



5. Service Application Software

Versions 2



6

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6. Troubleshooting

Bypassing Error Condition

If the instrument displays a red flag error condition, reboot the instrument and login as IRIS as login name and iris2k1 as password. Check the error log for details of error condition.

Decoding the Valves field in Valve Error Reports

The Valves field in an iQ200 valve error report is a hexadecimal number indicating the valves that failed. Since it is possible for more than one valve to fail, the hexadecimal scheme was chosen to represent the failed valve(s).

The following table delineates the information necessary to translate or decode the Valves field to ascertain the valve or valves that have failed.

Valve	I2C Address	J	Error Bit	Typical Hex
EBV	0x9E bit 1	J12	0	0x01
PBV	0x9E bit 0	J11	2	0x04
DRV	0x9C bit 1	J9	3	0x08
LBV	0x9C bit 0	J8	4	0x10
CBV	0x9A bit 1	J6	5	0x20
AMV	0x9C bit 2	J10	6	0x40
ACV	0x9A bit 2	J7	7	0x80



Note: Valve hex values will add if multiple valves fail simultaneously.
EXAMPLE: valve fail=0x44 Valves AMV and PBV both have failed.

Iris Diagnostics Contact Information

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Chatsworth, CA 91311
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Telephone
From U.S. locations (800) PRO-IRIS (776-4747)
From outside the U.S. +1-818-709-1244
Fax (818) 700-9661



6. Troubleshooting

Troubleshooting Guide

System locked up

System fails to start measuring or takes excessive time to start measuring.

Instrument is waiting for chemistry result (2min wait time)

System is offline

Low or empty Lamina

1. Check Lamina reservoir
2. Check for kinked Lamina tubing
3. Check if the fill pump is running

Peristaltic pump housing interlock

1. Check cassette sensor
2. Check locking screw sensor

Air system not pressurizing

1. Leak in air system
2. Check if the air pump is running

Auto focus failure

Camera cable is not connected to the RP computer

Could not capture background

1. Field of view of flow cell is not complete. Perform collimation.
2. Light level incorrectly set due to high light level set size per hex. value
3. Strobe bulb failure

Flow errors

1. Run control rack
2. Verify proper flow using Runfile analyzer
3. Possible fluidic obstruction or loose fitting within fluidic path

Focus is too far out for system to find starting point

1. Perform manual focus in Service mode

Failed OBA nudger

1. Verify that nudger operates in Service mode



6. Troubleshooting

No cells are visible

1. Verify using Runfile analyzer
2. Instrument is out of focus
3. Loose fitting in fluidic path
4. Clogged sample filter
5. Flow cell out of lateral position

iQ 200 fails to go to Standby

Low or empty Lamina

1. Check Lamina reservoir
2. Check for kinked Lamina tubing
3. Check fill pump operation

Peristaltic Pump housing interlock

1. Check cassette sensors (EP, LP, CP)
2. Check locking screw sensor (EP, LP, CP)

Air system not pressurizing

1. Leak in air system
2. Check if the air pump is running
3. Check air pressure system for leaks

SPA not homing

1. Horizontal not homing
2. Vertical not homing
3. Perform a SPA calibration procedure

STM fails to operate

1. Cabling problem between STM and STM SIC board

ID errors / Mismatch

1. Labels not aligned properly on the rack
2. Poor label quality
3. Focus or control label is in wrong position on Control rack
4. Symbology not set properly on reader
5. Barcode reader is misaligned
6. "White space" or "quiet zone" is too small
7. Labels too high or too low on tube



6. Troubleshooting

Sequential flag errors

1. Light level incorrectly set due to high light level cal. value
2. Debris on flow cell viewing area
3. Loose fitting in fluidic system
4. Bad strobe bulb

Image acquisition errors

1. Loose camera cable
2. Faulty camera
3. Faulty frame grabber board in PC

Valve failure to open or close

1. Valve is disconnected
2. Cold Valve
3. Valve failure

System does not go into Standby mode

1. Computer is not ON
2. No serial connection between iQ 200 and Computer
3. Restart Computer needed after error
4. Computer "sedmod.exe" application is not running

Samples take more than 60 seconds to process and complete

Low or empty Lamina

1. Check Lamina reservoir fluid volume and sensor status
2. Check for kinked Lamina tubing
3. Verify fill pump operation

Air system not pressurizing

1. Verify air pump operation
2. Air pressure leak within the air system

Positive control failure

1. Peri pump cassettes worn
2. REF Calibration needed
3. Loose fluidic path fitting
4. Obstruction in fluidic path (sample filter)
5. Flow cell failure



6. Troubleshooting

Negative control failure

1. Clogged sample filter
2. Contamination of Lamina
3. Contamination of Negative control

Calibration rack failed

1. Labels not aligned properly on the rack
2. Poor barcode label quality
3. STM tube detector is misaligned or out of calibration
4. Barcode reader is misaligned
5. Inadequate mixing (air pressure is low or there is a leak in air system)

Non uniform flow in Runfile

1. Fluid system leak
2. Obstruction in fluidic path (sample filter)
3. Loose fitting in fluidic system
4. Faulty peristaltic pump cassettes
5. Flow cell failure

Inconsistent cell count from run to run in Runfile

1. Faulty pump cassettes
2. Loose fitting in fluidic system
3. Obstruction in fluidic path (sample filter)
4. Low air pressure
5. Flow cell failure

SP-FLI (spatial flow index) is high in all Runfiles

1. Loose fitting in fluid system
2. Faulty pump cassettes
3. Obstruction in fluidic path (sample filter)
4. Flow cell failure

SP-KSP are high in all Runfiles

1. Peristaltic pump is not working properly
 - Faulty pump cassettes
 - Bad roller
2. Flow restriction in fluid system

Bubbles are present in fluid system

1. Cannula pump manifold leak
2. Loose fitting in fluid system
3. Faulty peristaltic pump cassettes



6. Troubleshooting

Waste well overflow

1. Waste pump failure
2. Float sensor failure in Lamina tank (Overflow from lamina tank)
3. Waste well overflow detector is wet
4. Overflow detector failure

Event Log Error Messages

Error Message in Maintenance	SPA Failure mode	FBA Failure mode	OBA Failure mode
SPA State 102 or 121, Sequence 27 or 29, Error timeout	Vertical up position fails to reach down		
MC State 153 Sequence 6			Focus dial not moving

6. Troubleshooting

Error Message in Maintenance	SPA Failure mode	FBA Failure mode	OBA Failure mode
SPA State 0 Sequence 18 Error: low-level controller, Detail: scanner error. Waste well overflow.	Lamina sensor in lamina tank is stuck down position - lamina overfills into waste well		
SPA State 3 Sequence 1 Error: timeout	Spa vertical motor failed to home		
SPA State 3 Sequence 1 Error: timeout	EP is not homing		
SPA State 3, Sequence 1 Error: timeout, Detail: N/A	EP not reaching to position during auto focus. This causes auto focus to fail, but after rack is ejected and EP attempts to go home during PH.		
SPA State 4 Sequence 1 Error: timeout	Spa rotational motor failed to home		
SPA State 8 Sequence 1 Error: timeout	Air system unable to reach setpoint		
SPA State 99 Sequence 26 Error: Timeout Detail: NA	EP not reaching to position		
SPA State 116, 135 Sequence 27 or 29 Error: timeout	Air system unable to reach setpoint		
SPA State 42 Sequence 13 Error: Low-level controller. Detail: scanner error. Spare.	EP not reaching to position		
SPA State 90 Sequence 25 Error: timeout	Spa rotational motor failed to home		

6. Troubleshooting

Error Message in Maintenance	SPA Failure mode	FBA Failure mode	OBA Failure mode
SPA State 91 Sequence 25 Error: timeout	Spa vertical motor failed to home		
SPA State 97 Sequence 25 Error: timeout	Air system unable to reach setpoint		
SPA State 99 Sequence 26 Error: timeout, Detail: N/A	EP not homing		
SPA State 100 Sequence 26, Error: Low-level controller. Detail: scanner error. Spare.	EP not reaching 45 deg on tube.		
SPA State 100 Sequence 26, Error: timeout	Vertical down to test tube not reaching to set position		
SPA State 103 Sequence 27, Error: timeout	Vertical up position fails to reach		
SPA State 104 Sequence 27, Error: Low-level controller, Detail: Scanner error spare	EP not reaching to position		
SPA State 106 Sequence 27, Error: timeout	Rotation fails to reach position		
SPA State 107 Sequence 27, Error: timeout	Vertical down position fails to reach up position		
SPA State 109 Sequence 27, Error: timeout	Vertical up position fails to reach		
SPA State 111 Sequence 27, Error: timeout	Vertical up position fails to home		
SPA State 113 Sequence 27, Error: timeout	Rotation fails to reach home position		
SPA State 116 or 135 Sequence 27 or 29, Error: timeout	Air system unable to reach setpoint		
SPA State 119 Sequence 28 Error: timeout, Detail: N/A	Rotation fails to reach position		

6. Troubleshooting

Error Message in Maintenance	SPA Failure mode	FBA Failure mode	OBA Failure mode
SPA State 105 or 124 Sequence 27 or 29, Error: timeout	Rotation fails to reach position		

Error Message in Maintenance	SPA Failure mode	FBA Failure mode	OBA Failure mode
FBA State 42 Sequence 17 Error: low-level controller, detail: scanner error. Spare		LP unable to reach position	
FBA State 3 Sequence 1 Error: timeout		CP not moving at proper velocity	
FBA State 3 Sequence 1 Error: timeout		LP not moving at proper velocity	
FBA State 5 Sequence 2 Error: timeout		CP not moving at proper velocity	
FBA State 9 Sequence 4 Error: timeout		LP not moving at proper velocity	
FBA State 42 Sequence 17 Error: timeout, detail: N/A		CP not reaching 45 deg position on tube	
FBA State 42 Sequence 17 Error: timeout, detail: N/A		LP unable to home	
FBA State 42 Sequence 17 Error: timeout, detail: N/A		CP is not homing	
FBA State 42 Sequence 17 Error: timeout, detail: N/A		CP not moving at proper velocity	

Electronics

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7. Electronics

Electronics

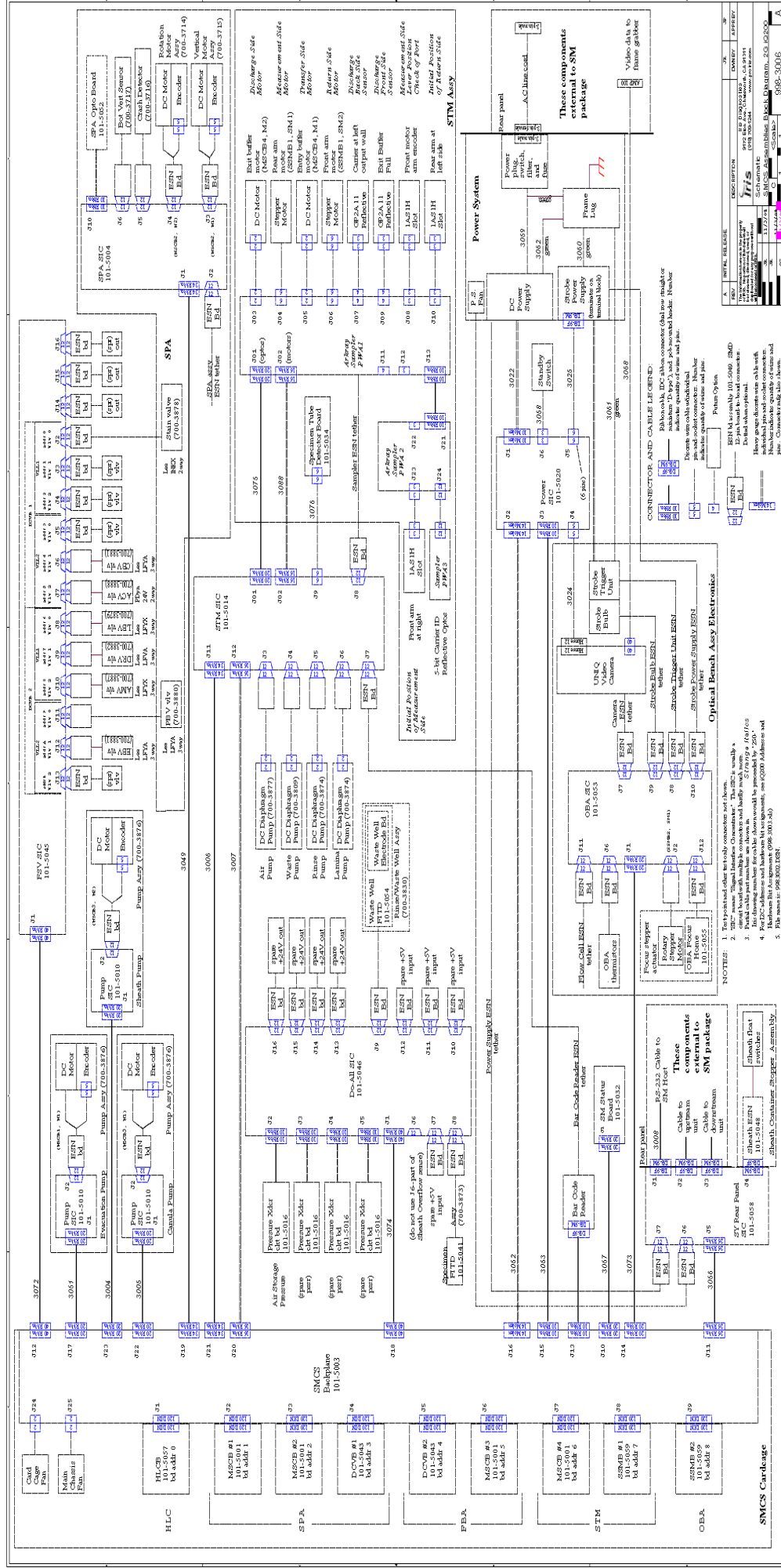
General Functions

The electronic and electronically based functions of the Microscopy Module are identified as follows:

- High level hierarchical software control of lower-level functions,
- Communications between microcontrollers at adjacent hierarchical levels via inter integrated circuit communications links,
- Communications with the Microscopy Module Computer via an RS-232 link,
- Indications via visual displays of Microscopy Module status,
- Closed-loop control of some DC motors,
- Position sensing of various mechanical movements of the subsystems,
- Open loop control (power off-on) of DC motors,
- Control of discrete DC solenoid valves,
- Control of a system of DC solenoid-actuated valves and sensing proper operation of the valves,
- Sensing of the presence or absence of water based fluids in a small-diameter tube, and the level of water based fluids in a waste well,
- Electrical sensing of various digital and analog status signals,
- Control of high- and low- speed stepper motors
- Controlling and receiving data from a bar-code scanner
- Local ambient temperature sensing and DC fan-motor control
- Control (but not data) interfacing with the data-processing parts of the iQ200
- The electronic serial number system, an electronic system for identifying the individual assemblies, subassemblies and other elements that represent the totality of the iQ200 Microscopy Module.

7. Electronics

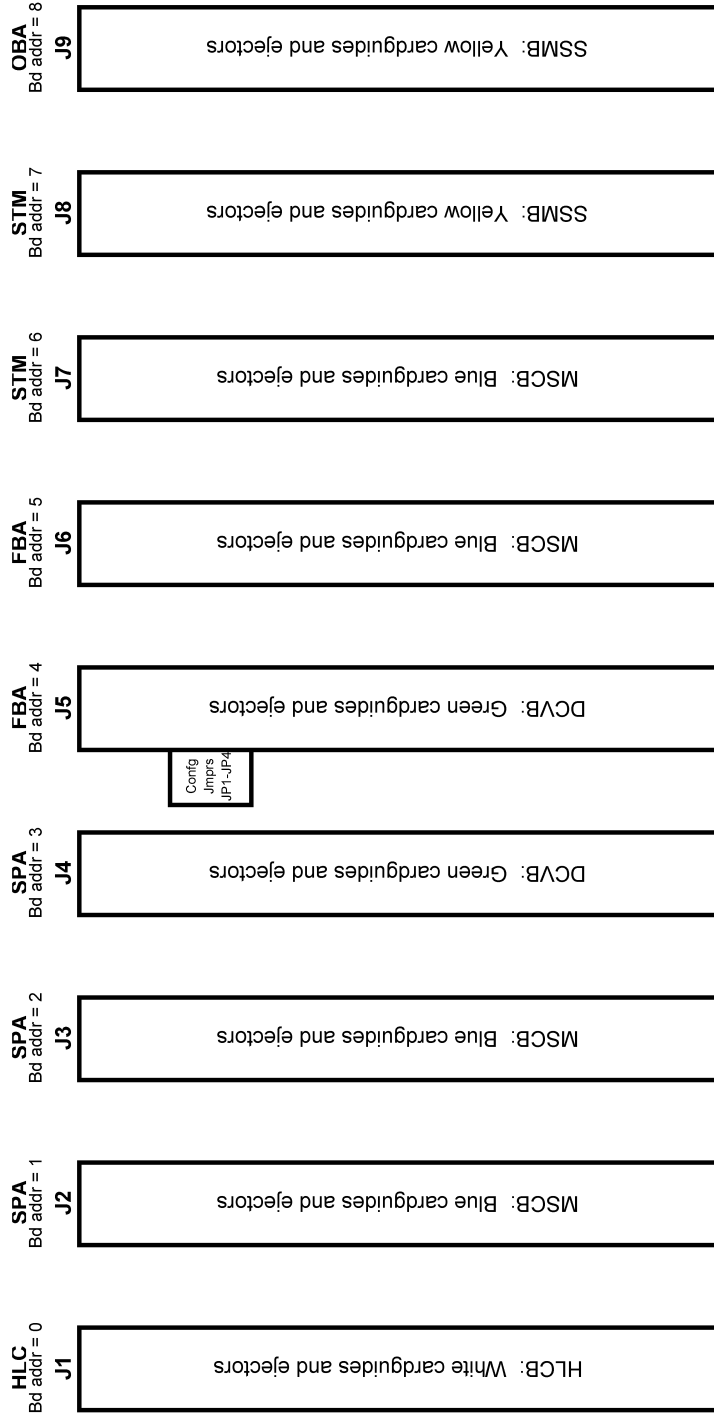
Cabling Diagram Overview



7. Electronics

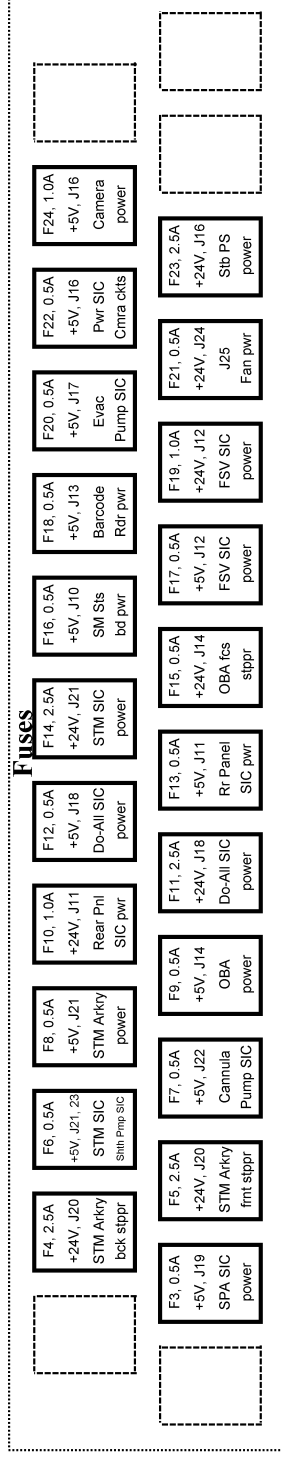
View of Backplane inside Cardcage

View of Backplane inside Cardcage

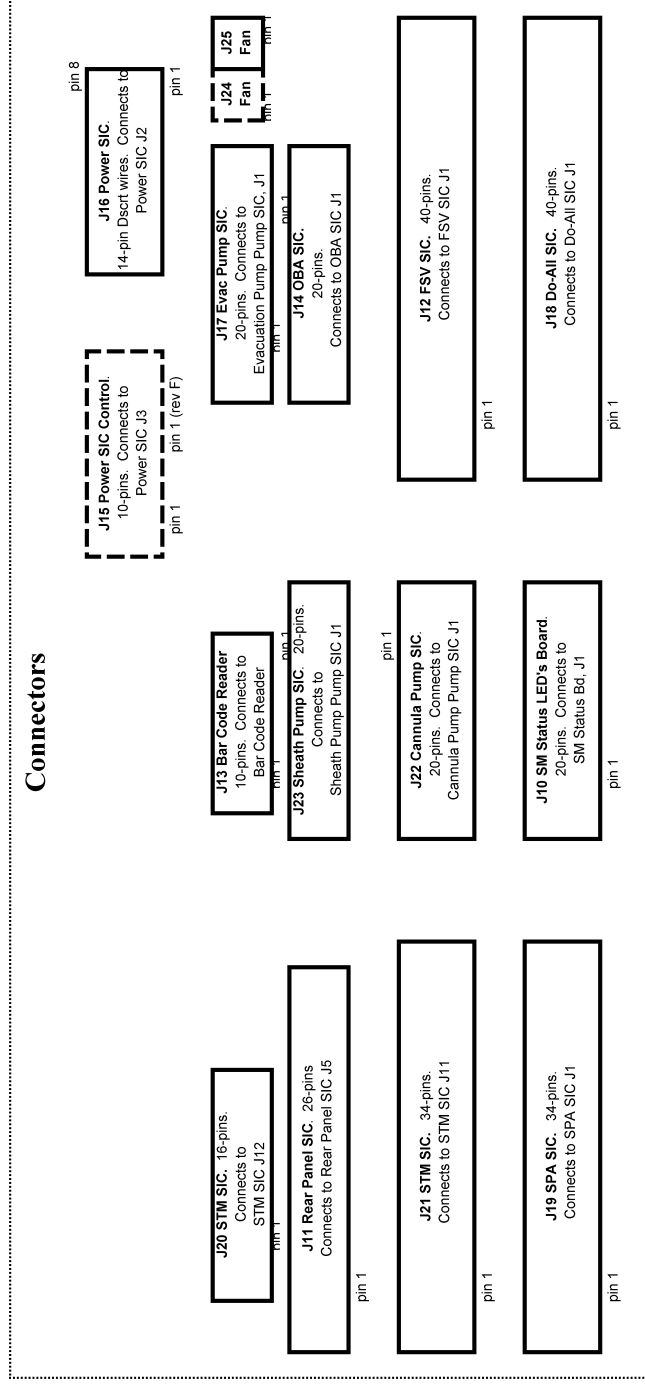


7. Electronics

Rear view of Backplane -- Fuses and Connections to Internal parts of Microscopy Module



Connectors



7. Electronics

Addresses and Summary

Item #	Bd Addr	Board Type	Board Name	Sub-Sys.	PIC-18	PIC-16	RS232 Diag	ICD prog	Controls	I2C Addresses						
										fixed addr	HLB	SPA	FBA	STM	DSP	VM
1	0	HLCB	HLCB	HLB	MST		J501-1		Master Controller (runs the HLB)							
a									I2C serial EEPROM 8Kx8	yes	A4					
b						FQM	J502-3	J301-1	Field Query Manipulator, Front panel Xfoc		80					
c					SPA		J501-2		High Level SPA control		82					
d									SPA serial EEPROM 32x8	yes		A4				
e					FBA		J501-3		High Level FBA control		84					
f									FBA serial EEPROM 32Kx8	yes		A4				
g					STM		J501-4		High Level STM control		86			A4		
h									STM serial EEPROM 32Kx8	yes				A4		
i									Bar Code Reader (RS-232 Interface directly to STM PIC-18)					--		
j					DSP		J502-1		Device Status Processor (DSP)		8A					
k									DSP serial EEPROM 32Kx8	yes					A4	
l					OBA		J502-2		Optical Bench control		88					
m									OBA serial EEPROM 32Kx8	yes						A4
2	1	MSCB	SPA MSCB 1	SPA												
a						M1	J302-1	J301-1	Evacuation Pump			B0				
b						M2	J302-2	J301-2				B2				
c						SCN	J302-3	J301-3	SPA scngng, Crash Det via XSCAN, Air Pump, Waste Pump, Rinse Pump, spare pump.			D0				
3	2	MSCB	SPA MSCB 2	SPA												
a						M1	J302-1	J301-1	Pipetter Vertical Motion			B4				
b						M2	J302-2	J301-2	Pipetter Rotational Motion			B6				
c						SCN	J302-3	J301-3	Pipetter motion end limits; Crash reset pulse; SVV, SPV, 5 spare valves; fuse monitors F9, F10, F13, F17, F18, F22, F25.			D2				
4	3	DCVB	SPA DCVB 1	SPA												
a						VM	J302-1	J301-1	SPA Valve Mid PIC			92				98
b						VLL1	J302-2	J301-2	SPA Valves, Low Level Cntrlr #1 (valves 1-3)							
c						VLL2	J302-3	J301-3	SPA Valves, Low Level Cntrlr #2 (valves 4-6)							9A
5	4	DCVB	FBA DCVB 2	FBA												
a						VM	J302-1	J301-1	FBA Valve Mid PIC (* I2C bus depends on jumpers on the backplane)			92*				92*
b						VLL1	J302-2	J301-2	FBA Valves, Low Level Cntrlr #1 (valves 7-9)							9C
c						VLL2	J302-3	J301-3	FBA Valves, Low Lvl Cntrlr #2 (valves 10-12)							9E

7. Electronics

Item #	Bd Addr	Board Type	Board Name	Sub-Sys.	PIC-18	PIC-16	RS232 Diag	ICD prog	Controls	I2C Addresses							
										fixed addr	HLB	SPA	FBA	STM	DSP	OBA	VM
6	5	MSCB	FBA MSCB 3	FBA													
	a					M1	J302-1	J301-1	Cannula Pump				B0				
	b					M2	J302-2	J301-2	Sheath Pump				B2				
	c				SCN		J302-3	J301-3	Cannula & Sheath pmp limits, Cannula & Sheath prsr xdcrs; SVV, SPV, 5 spare valves, fuse monitors: F11, F12, F20, F23, F24				D0				
7	6	MSCB	STM MSCB 4	STM													
	a					M1	J302-1	J301-1	Arkray Carrier Input Tray DC motor					B0			
	b					M2	J302-2	J301-2	Arkray Carrier Output Tray DC motor					B2			
	c				SCN		J302-3	J301-3	STD; fuse monitors: F1-F8, F19, F21; Arkray carrier ID input signal; down stream rdy; up stream strt; Carrier ID addresses; down stream strt; upstream rdy					D0			
8	7	SSMB	STM SSMB 1	STM													
	a					DCM	J303-1	J301-1						B4			
	b					SM1	J303-2	J301-2	Measurement (Inboard) Linear Stepper					B6			
	c					SM2	J303-3	J301-3	Front (Outboard) Linear Stepper					B8			
	d				SCN		J303-4	J301-4	Arkray position detectors; cardcage thermistor; main thermistor; card cage fan; main fan; upstream & dwnstrm pwr control, Arkray US & DS reset.					D2			
9	8	SSMB	OBA SSMB 2	OBA													
	a					DCM	J303-1	J301-1								B4	
	b					SM1	J303-2	J301-2	Optical Bench Focus Stepper							B6	
	c					SM2	J303-3	J301-3								B8	
	d				SCN		J303-4	J301-4	Optical Bench sensors							D2	
10	--	Power SIC	Power SIC	HLB		STB	J203-1	J203-1	Strobe Power Supply (not in card cage)		8C						

7. Electronics

BA: Board Address BT: Board Type BN: Board Name SS: Sub system	PIC-18 PIC-16	Controls or Monitors	parameters & Notes	special Notes
BA: 0 BT: HLCB BN: HLCB SS: HLCB	MST	Master Controller		
		MST serial EEPROM 32K x 8	I2C: HLB A4	
	SPA	High Level SPA control	I2C: HLB 82	
		SPA serial EEPROM 32K x 8	I2C: SPA A4	
	FBA	High Level FBA control	I2C: HLB 84	
		FBA serial EEPROM 32K x 8	I2C: FBA A4	
	STM	High Level STM control	I2C: HLB 86	
		STM serial EEPROM 32K x 8	I2C: STM A4	
		Bar Code Reader	RS-232 interface directly to STM PIC-18	
	OBA	High Level OBA control	I2C: HLB 88	
		OBA serial EEPROM 32K x 8	I2C: OBA A4	
	DSP	Device Status Processor (DSP)	I2C: HLB 8A	
		DSP serial EEPROM 32K x 8	I2C: DSP A4	
		ESN Group Control	ESN RLY STS bit	
		ESN Group Ctrl Bit 0	0 (B15)	look on Do-All SIC for Relay Status LED -- LED on when relay on
		ESN Group Ctrl Bit 1	1 (C15)	look on Do-All SIC for Relay Status LED -- LED on when relay on
		ESN Group Ctrl Bit 2	2 (A16)	look on Do-All SIC for Relay Status LED -- LED on when relay on
	FQM	Field Query Manipulator	I2C: HLB 80	
		Analog inputs	Ana In STS bit	
		Sheath signal	0 (A19)	8-lvl ana sig. 1st thrshld
		Sheath signal	0 (A19)	8-lvl ana sig. 2nd thrshld
		Sheath signal	0 (A19)	8-lvl ana sig. 3rd thrshld
		SHEATH-OVRFLW	1 (B19)	do not scan on FQM
		2.5V Ref	2	Analog measurement
		Switch Inputs	XSW-IN STS bit	
		Pauses Switch input	0 (A26)	
		Indicator LED Drive Outputs	XLED XLD STS	
		Pause Switch Green LED	0 (A28)	low-true
		Pause Switch Red LED	1 (C28)	low-true
		SM Status "Error" LED	2 (A29)	low-true
		SM Status "Standby" LED	3 (B29)	low-true
		SM Status "Measure" LED	4 (C29)	low-true
			5 (A30)	
			6 (B30)	
			7 (C30)	

7. Electronics

BA: Board Address BT: Board Type BN: Board Name SS: Sub system		PIC-18 PIC-16	Controls or Monitors	parameters & Notes		Special Conditions		Special Notes									
BA: 1																	
BT: MSCB BN: SPA MSCB 1 SS: SPA		M1	Evacuation Pump	I2C: SPA B0 (M+: A33, M-: A34) (A: A18, B: A17)		Home function associated with Analog input & Opto LED as below											
		M2	(spare)	I2C: SPA B2 (M+: B33, M-: B34) (A: C18, B: C17)		Motor stop on Crash Detect or Stop-All-Motors PID param: kp = 0x0090, ki =0x0020, kd = 0x0100											
		SCN	SPA scanning	I2C: SPA D0		PID param: kp = 0x0090, ki =0x0020, kd = 0x0100											
						Functions assigned and controlled as detailed below											
			Analog inputs & Opto LEDs	Ana In	Sts LED	Opto Type	Opto LED	LED cur	Period	Load	Gain	Lw Thr	Hi Thr				
			M1 (Evac Pump) Home	0 (A19)	0	HOA0708	0 (A26)	40ma	long	2.8K to GND	hi	72	255	Automatic "Home Function"			
			Sheath Pump Home	1 (B19)	1	HOA0708	1 (B26)	40ma	long	2.8K to GND	hi	72	255	Automatic "Home Function"			
				2 (C19)	2												
				3 (A20)	3												
			Air storage prssr (Do-All SIC J2)	4 (B20)	4	n/a	none	n/a	long*	2.8K to GND*	low	72	255	*Also available on MSCB3, but only of the two (MSCB1 or MSCB3) should be scanned.			
			(spare prssr #3) (Do-All SIC J3)	5 (C20)	5	n/a	none	n/a	long*	2.8K to GND*	low	72	255				
			(spare prssr #1) (Do-All SIC J4)	6 (A21)	6	n/a	none	n/a	long*	2.8K to GND*	low	72	255				
			(spare prssr #2) (Do-All SIC J5)	7 (B21)	7	n/a	none	n/a	long*	2.8K to GND*	low	72	255				

7. Electronics

BA: Board Address BT: Board Type BN: Board Name SS: Sub system	PIC-18 PIC-16	Controls or Monitors	parameters & Notes				Special Notes
BA: 1 (cont) BT: MSCB BN: SPA MSCB 1 SS: SPA	SCN (cont)	+24V Outputs	+24V Out	Dty Cyc	Other Conditions		
		Rinse dphgrm pmp (STM SIC J5)	0 (A35)	1/1			
		Waste dphgrm pmp (STM SIC J4)	1 (C35)	1/1			
		Air dphgrm pmp (STM SIC J3)	2 (A36)	1/1			
		Sheath dphgrm pmp (STM SIC J6)	3 (B36)	1/1	Control Shared with MSCB 3		
		+24V Inputs	+24V In	Sts Bit			
		Code ID	0 (A32)	0	Tells the PIC whether FM1 or FM2 and up		"1" = FM1.5 and up
		Digital Outputs	Dig Out	Dty Cyc			
		Digital Inputs	Dig In	Sts Bit			
		Evac pump cassette in place	0 (A15)	0			
		Evac pump cover in place	1 (B15)	1			
		SHEATH-OVRFLW (Do-All SIC J6)	2 (C15)	2	Is also wired to FQM analog 1, but should not be used thereon.		J6, R8, D11 rmvd frm Do-All SIC
		Stain Out FITD (Do-All SIC J7)	3 (A16)	3			
		Specimen FITD (Do-All SIC J8)	4 (B16)	4	Also available on MSCB3		"1" indicates liquid present
		Waste Well FITD (Do-All SIC J9)	5 (C16)	5	Also available on MSCB3		"1" indicates waste well overflow
		Stop All Motors	6 (B17)	6	Door Interlocks--activates if a door is open		low-true
		XSCAN	XSCAN				
		Crash Detect (soft)	0 (A08)				low-true

7. Electronics

Hardware Bit Assignments and Details

BA: Board Address BT: Board Type BN: Board Name SS: Sub system		PIC-18 PIC-16	Controls or Monitors	parameters & Notes		Special Conditions										special Notes
BA: 2 BT: MSCB BN: SPA MSCB 2 SS: SPA																
		M1	Pipetter Vertical Motion	I2C: SPA B4 (M+: A33, M-: A34) (A-: A18, B: A17)		Home function associated with Analog input & Opto LED as below Motor down stop on Crash Detect or stop on Stop-All-Motors PID param: kp = 0x0090, ki = 0x0028, kd = 0x0020, il = 0x0180										
		M2	Pipetter Rotational Motion	I2C: SPA B6 (M+: B33, M-: B34) (A-: C18, B: C17)		Home function associated with Analog input & Opto LED as below Motor stop on Crash Detect or or Stop-All-Motors PID param: kp = 0x0100, ki = 0x0100, kd = 0x1000, il = 0x1000										
		SCN	SPA scanning, Motion end limits, heater, crash dtct, Irisolve Pmp	I2C: SPA D2		Functions assigned and controlled as detailed below										
			Analog inputs & Opto LEDs	Ana In	Sts LED	Opto Type	Opto LED	LED cur	Period	Load	Gain	Lw Thr	Hi Thr			
			M1 (Vertical Motion--top sensor) Home CW	0 (A19)	0	QVA11134	0 (A26)	35 ma	long	2.8K to GND	low	0	61	Vertical Board--Auto "Dual Home Function"		
			M2 (Rotational Motion--back sensor) Home CW	1 (B19)	1	QVA11134	1 (B26)	35 ma	long	2.8K to GND	low	0	61	Auto "Dual Home Function"		
			M2 (Rotational Motion--front sensor) Home CCW	2 (C19)	5											
			Soft Crash	3 (A20)	3	QVA11134	3 (A27)	35 ma	long	2.8K to GND	low	0	61	Auto "Dual Home Function"		
			M2 (Vert Motion--bottom sensor) Home CW	4 (B20)	4	n/a	none	--	short	698 to GND	low	0	128	This is a pair of snap-action switches		
				5 (C20)	2	n/a	none	--	short	698 to GND	low	0	128	Vertical Board--Auto "Dual Home Function" This detector is a snap-action switch		
				6 (A21)	6											
				7 (B21)	7											
				8 (C21)												
			F25 monitor: J10+5VM	9 (A22)	9	n/a	none	--	short	none	low	164	255	slow scan fuse monitor funct.		
			F22 monitor: J16+5VM	10 (B22)	10	n/a	none	--	short	none	low	164	255	slow scan fuse monitor funct.		
			F13 monitor: J11+5VM	11 (C22)	11	n/a	none	--	short	none	low	164	255	slow scan fuse monitor funct.		
			F10 monitor: J11+24VM	12 (A23)	12	n/a	none	--	short	none	low	176	255	slow scan fuse monitor funct.		
			F17 monitor: J12+5VM	13 (C23)	13	n/a	none	--	short	none	low	164	255	slow scan fuse monitor funct.		
			F18 monitor: J13+5VM	14 (A24)	14	n/a	none	--	short	none	low	164	255	slow scan fuse monitor funct.		
	F9 monitor: J14+5VM	15 (B24)	15	n/a	none	--	short	none	low	164	255	slow scan fuse monitor funct.				

7. Electronics

BA: Board Address BT: Board Type BN: Board Name SS: Sub system	PIC-18 PIC-16	Controls or Monitors	parameters & Notes			special Notes
BA: 2 (cont) BT: MSCB BN: SPA MSCB 2 SS: SPA	SCN (cont)	+24V Outputs	+24V Out	Dty Cyc		
		ASV (Do-All SIC J13)	0 (A35)	1/1	Control Shared with MSCB 3	Sig name on bkpin: SPV-VLV
		(spare valve #6 -- Do-All SIC J14)	1 (C35)	1/1	Control Shared with MSCB 3	Sig name on bkpin: SVV-VLV
		(spare valve #1 -- Do-All SIC J15)	2 (A36)	1/1	Control Shared with MSCB 3	
		(spare valve #2 -- Do-All SIC J16)	3 (B36)	1/1	Control Shared with MSCB 3	
		(spare valve #3 -- FSV SIC J14)	4 (C36)	1/1	Control Shared with MSCB 3	
		(spare valve #4 -- FSV SIC J15)	5 (A37)	1/1	Control Shared with MSCB 3	
		(spare valve #5 -- FSV SIC J16)	6 (B37)	1/1	Control Shared with MSCB 3	
			7 (C37)			
		+24V Inputs	+24V In	Sts Bit		
		Code ID	0 (A32)	0	Tells the PIC whether FM1 or FM2 and up	"1" = FM1.5 and up
		Digital Outputs	Dig Out	Dty Cyc		
		SPA Vertical Motor Enable Pulse (Crash reset pulse)	0 (C10)	1/1		
		Digital Inputs	Dig In	Sts Bit		
		(spare +5V in #1 -- Do-All SIC J10)	0 (A15)	0		
		(spare +5V in #2 -- Do-All SIC J11)	1 (B15)	1		
		(spare +5V in #3 -- Do-All SIC J12)	2 (C15)	2		
		Hard Crash	3 (A16)	3	Occurs when SPA relay drops out due to excessive crash	low-true
			4 (B16)	4		
			5 (C16)	5		
		Stop All Motors	6 (B17)	6	Door Interlocks--activates if a door is open	low-true
		XSCAN	XSCAN			
		Crash Detect (soft)	0 (A08)			low-true
		Crash Detect (hard)	1 (A09)			low-true

7. Electronics

BA: Board Address BT: Board Type BN: Board Name SS: Sub system	PIC-18 PIC-16	Controls or Monitors	parameters & Notes	special Notes
BA: 3 BT: DCVB BN: SPA DCVB 1 SS: SPA	VM	SPA Valves	I2C: SPA 92	
		Valve Name	Valve Addr (hex)	
		Stain	0	
		ASV (Air Supply Valve)	1	Control Shared with DCVB 2
		(spare)	2	Control Shared with DCVB 2
		AMV (Air Mix Valve)	3	Control Shared with DCVB 2
		CBV	4	Control Shared with DCVB 2
		(spare)	5	Control Shared with DCVB 2
		SBV (stain Bypass Valve)	6	Control Shared with DCVB 2
		DRV	7	Control Shared with DCVB 2
		(spare)	8	Control Shared with DCVB 2
		PBV	9	Control Shared with DCVB 2
		EBV	A	Control Shared with DCVB 2
		(spare)	B	Control Shared with DCVB 2
	VLL1	Low Level Valve Drive 1	I2C: VM 98	
		Stain Valve	1 (Hi: A32, Lo:A33)	(FSV SIC, J2)
		ASV	2 (Hi: B32, Lo:B33)	(FSV SIC, J3)
	VLL2	(spare)	3 (Hi: C32, Lo:C33)	(FSV SIC, J4)
		Low Level Valve Drive 2	I2C: VM 9A	
		AMV	4 (Hi: A34, Lo:A35)	(FSV SIC, J5)
		CBV	5 (Hi: C32, Lo:C33)	(FSV SIC, J6)
		(spare)	6 (Hi: A36, Lo:A37)	(FSV SIC, J7)

7. Electronics

BA: Board Address BT: Board Type BN: Board Name SS: Sub system	PIC-18 PIC-16	Controls or Monitors	parameters & Notes		Special Conditions										special Notes
BA: 5 BT: MSCB BN: FBA MSCB 3 SS: FBA	M1	Cannula Pump	I2C: FBA B0		Home function associated with Analog input & Opto LED as below										
			(M+: A33, M-: A34) (A: A18, B: A17)		Motor stop on Crash Detect. Stop-All-Motors or CP door open										
	M2	Sheath Pump	I2C: FBA B2		PID param: kp = 0x0090, ki = 0x0020, kd = 0x0020, il = 0x0100										
			(M+: B33, M-: B34) (A: C18, B: C17)		Home function associated with Analog input & Opto LED as below										
					Motor stop on Crash Detect. Stop-All-Motors or SP door open										
					PID param: kp = 0x0090, ki = 0x0020, kd = 0x0020, il = 0x0100										
	SCN	FBA scanning	I2C: FBA D0		Functions assigned and controlled as detailed below										
		Analog inputs & Opto LEDs	Ana In	Sts LED	Opto Type	Opto LED	LED cur	Period	Load	Gain	Lw Thr	Hi Thr			
		M1 (Cannula Pump) Home	0 (A19)	0	HOA0708	0 (A26)	40ma	long	2.8K to GND	high	72	255	Automatic "Home Function"		
		M2 (Sheath Pump) Home	1 (B19)	1	HOA0708	1 (B26)	40ma	long	2.8K to GND	high	72	255	Automatic "Home Function"		
			2 (C19)	2											
			3 (A20)	3											
		Air storage prssr (Do-All SIC J2)	4 (B20)	4	n/a	none	n/a	long*	2.8K to GND*						
		Stain Bottle prssr (Do-All SIC J3)	5 (C20)	5	n/a	none	n/a	long*	2.8K to GND*						
		(spare prssr #1) (Do-All SIC J4)	6 (A21)	6	n/a	none	n/a	long*	2.8K to GND*						
		(spare prssr #2) (Do-All SIC J5)	7 (B21)	7	n/a	none	n/a	long*	2.8K to GND*						
			8 (C21)	8											
		F24 monitor: J16-CAM+24VM	9 (A22)	9	n/a	none	--	short	none	low	176	255	slow scan fuse monitor funct.		
		F23 monitor: J16-STB+24VM	10 (B22)	10	n/a	none	--	short	none	low	176	255	slow scan fuse monitor funct.		
		F20 monitor: J17+5VM	11 (C22)	11	n/a	none	--	short	none	low	164	255	slow scan fuse monitor funct.		
		F12 monitor: J18+5VM	12 (A23)	12	n/a	none	--	short	none	low	164	255	slow scan fuse monitor funct.		
		F11 monitor: J18+24VM	13 (C23)	13	n/a	none	--	short	none	low	176	255	slow scan fuse monitor funct.		
		F3 monitor: J19+5VM	14 (A24)	14	n/a	none	--	short	none	low	164	255	slow scan fuse monitor funct.		
		F14 monitor: J21+24VM	15 (B24)	14	n/a	none	--	short	none	low	176	255	slow scan fuse monitor funct.		

7. Electronics

BA: Board Address BT: Board Type BN: Board Name SS: Sub system	PIC-18 PIC-16	Controls or Monitors	parameters & Notes			Special Notes
BA: 5 (cont) BT: MSCB BN: FBA MSCB 3 SS: FBA	SCN (cont)	+24V Outputs	+24V Out	Dty Cyc		
		(spare valve #6 -- Do-All SIC J13)	0 (A35)	1/1	Control Shared with MSCB 2	Sig name on bkpin: SPV-VLV
		(spare valve #6 -- Do-All SIC J14)	1 (C35)	1/1	Control Shared with MSCB 2	Sig name on bkpin: SVV-VLV
		(spare valve #1 -- Do-All SIC J15)	2 (A36)	1/1	Control Shared with MSCB 2	
		(spare valve #2 -- Do-All SIC J16)	3 (B36)	1/1	Control Shared with MSCB 2	
		(spare valve #3 -- FSV SIC J14)	4 (C36)	1/1	Control Shared with MSCB 2	
		(spare valve #4 -- FSV SIC J15)	5 (A37)	1/1	Control Shared with MSCB 2	
		(spare valve #5 -- FSV SIC J16)	6 (B37)	1/1	Control Shared with MSCB 2	
		Sheath dphigm pmp (STM SIC J6)	7 (C37)	1/1	Control Shared with MSCB 1	Sig nm on bkpin: SPR+24V-DRV
		+24V Inputs	+24V In	Sts Bit		
		Code ID	0 (A32)	0	Tells the PIC whether FM1 or FM2 and up	"1" = FM1.5 and up
		Digital Outputs	Dig Out	Dty Cyc		
		Digital Inputs	Dig In	Sts Bit		
		Cannula Pump Cassette In Place	0 (A15)	0		
		Cannula Pump Cover In Place	1 (B15)	1		
		Sheath Pump Cassette In Place	2 (C15)	2		
		Sheath Pump Cover In Place	3 (A16)	3		
		Specimen FITD (Do-All SIC J8)	4 (B16)	4	Also available on MSCB1	"1" indicates liquid present
		Waste Well FITD (Do-All SIC J9)	5 (C16)	5	Also available on MSCB1	"1" indicates waste well overflow
		Stop All Motors	6 (B17)	6	Door Interlocks--activates if a door is open	low-true
		XSCAN	XSCAN			
		Crash Detect	0 (A08)			

7. Electronics

BA: Board Address BT: Board Type BN: Board Name SS: Sub system	PIC-18 PIC-16	Controls or Monitors	parameters & Notes		Special Conditions							special Notes	
BA: 6 BT: MSCB BN: STM MSCB 4 SS: STM				I2C: STM B0									
	M1	Arkray Carrier Input Buffer DC motor		(M+: A33, M-: A34) (A: A18, B: A17)									
	M2	Arkray Carrier Output Buffer DC motor		I2C: STM B2									
				(M+: B33, M-: B34) (A: C18, B: C17)									
	SCN	Arkray Sampler scanning: Position Detectors		I2C: STM D0	Functions assigned and controlled as detailed below								
		Analog inputs & Opto LEDs	Ana In	Sts LED	Opto Type	Opto LED	LED cur	Period	Load	Gain	Lw Thr	Hi Thr	
		Specimen Tube Present (STD)	0 (A19)	0	MV8141 L14N1	0 (A26)	50ma	long	2.8K to GND	low	80	255	
		(Unused, but scanned)	1 (B19)	n/a				long					To insert delay so duty cycle of STD isn't so high
		(Unused, but scanned)	2 (C19)	n/a				long					To insert delay so duty cycle of STD isn't so high
		(Unused, but scanned)	3 (A20)	n/a				long					To insert delay so duty cycle of STD isn't so high
		F4 monitor: J20-SM1+24VM	4 (B20)	4	n/a	none	--	short	none	low	143	255	slow scan fuse monitor funct.
		F5 monitor: J20-SM2+24VM	5 (C20)	5	n/a	none	--	short	none	low	143	255	slow scan fuse monitor funct.
		F8 monitor: J21+5VM	6 (A21)	6	n/a	none	--	short	none	low	164	255	slow scan fuse monitor funct.
		F7 monitor: J22+5VM	7 (B21)	7	n/a	none	--	short	none	low	164	255	slow scan fuse monitor funct.
		F6 monitor: J23+5VM	8 (C21)	8	n/a	none	--	short	none	low	164	255	slow scan fuse monitor funct.
			9 (A22)	9									
		F15 monitor: J14-SM1+24VM	10 (B22)	10	n/a	none	--	short	none	low	176	255	slow scan fuse monitor funct.
		F19 monitor: J12+24VM	11 (C22)	11	n/a	none	--	short	none	low	176	255	slow scan fuse monitor funct.
			12 (A23)	12									
		F21 monitor: J24+24VM	13 (C23)	13	n/a	none	--	short	none	low	176	255	slow scan fuse monitor funct.

7. Electronics

BA: Board Address BT: Board Type BN: Board Name SS: Sub system	PIC-18 PIC-16	Controls or Monitors	parameters & Notes			Special Notes
BA: 6 (cont) BT: MSCB BN: STM MSCB 4 SS: STM	SCN (cont)	+24V Outputs	+24V Out	Dty Cyc		
		+24V Inputs	+24V In	Sts Bit		
		Code ID	0 (A32)	0	Tells the PIC whether FM1 or FM2 and up	"1" = FM1.5 and up
		Digital Outputs	Dig Out	Dty Cyc		
		Carrier ID address 0	0 (C10)	1/1	Arkray J01-13	
		Carrier ID address 1	1 (C11)	1/1	Arkray J01-14	
		Carrier ID address 2	2 (A12)	1/1	Arkray J01-15	
		SM-DS-OUT	3 (B12)	1/1		
		SM-US-OUT	4 (C12)	1/1		
		Digital Inputs	Dig In	Sts Bit		
		Carrier ID Selected Signal	0 (A15)	0	Arkray J01-12	
		SM-DS-IN!	1 (B15)	1	lo-true	
		SM-US-IN!	2 (C15)	2	lo-true	
		Stop All Motors	6 (B17)	6	Door Interlocks--activates if a door is open	low-true
		XSCAN	XSCAN			
		Crash Detect	0 (A08)			

7. Electronics

BA: Board Address BT: Board Type BN: Board Name SS: Sub system	PIC-18 PIC-16	Controls or Monitors	parameters & Notes							special Notes		
				Special Conditions								
	DCM			I2C: STM B4								
				(M+: A33, M-: A34) (A: A18, B: A17)								
	SM1	Measurement (Inboard) Linear Stepper		I2C: STM B6	Home function associated with Analog input as below							
	SM2	Front (Outboard) Linear Stepper		I2C: STM B8	Motor stop on Crash Detect or Stop-All-Motors							
					Home function associated with Analog input as below							
					Motor stop on Crash Detect or Stop-All-Motors							
	SCN	STM scanning: Position Detectors		I2C: STM D2	Functions assigned and controlled as detailed below							
		Analog inputs & Opto LEDs	Ana In	Sts LED	Opto Type	Opto LED	LED cur	Period	Load	Gain	Lw Thr	Hi Thr
		0 (A19)	0									
		1 (B19)	1									
	Msrmt Stepper Home sensor	2 (C19)	2	Arkray	n/a	--	short	2.5K to +5V	low	0	128	Arkray J01-06
	Front Stepper Home sensor	3 (A20)	3	Arkray	n/a	--	short	2.5K to +5V	low	0	128	Arkray J01-07
	Code ID	5 (C20)	5	n/a	none	--	short	1.4K to GND	low	0	100	"I" = FM1.5 and above
	Card cage thermistor	6 (A21)	6	n/a	none	--	short	5K to +5V	low	146	157	card cage fan cntrl: 34°C/29°C
	Main chassis thermistor	7 (B21)	7	n/a	none	--	short	5K to +5V	low	146	157	main chassis fan cntrl: " " "
	+24V Outputs		Dty Cyc	Notes								
	Card cage fan	0 (A35)	1/1	Activates based on ANA-IN 6. @ 34°C fan turns on, 29°C fan turns off.								
	Main fan	1 (C35)	1/1	Activates based on ANA-IN 7. @ 34°C fan turns on, 29°C fan turns off.								
	+24V Inputs		Sts Bit	Notes								
	Digital Outputs		Dty Cyc	Notes								
	Supply Upstream Power	0 (C10)	1/1									
	Supply Dnstream Power	1 (C11)	1/1									
	Upstrm & DwnStrm Reset	2 (A12)	1/1									
				Hi-true reset								

7. Electronics

BA: Board Address BT: Board Type BN: Board Name SS: Sub system	PIC-18 PIC-16	Controls or Monitors	parameters & Notes			special Notes
			Dig In	Sts Bit	Notes	
BA: 7 BT: SSMB BN: OBA SSMB 1 SS: OBA	SCN (cont)	Digital Inputs				
		Discharge Back-side sensor	0 (A15)	0	Arkray J01-04	
		Discharge Front-side sensor	1 (B15)	1	Arkray J01-03	
		Transfer Front-side sensor	2 (C15)	2	Arkray J01-02	
		Meas side lvr pos chck of port	3 (A16)	3	Arkray J01-08	
		Slat Set sensor	4 (B16)	4	Arkray J01-09	
		Slat Case sensor	5 (C16)	5	Arkray J01-11	
		Stop All Motors	6 (B17)	6	Door Interlocks--activates if a door is open	low-true
		XSCAN	XSCAN		Notes	
		Crash Detect	0 (B13)			

7. Electronics

BA: Board Address BT: Board Type BN: Board Name SS: Sub system	PIC-18 PIC-16	Controls or Monitors	parameters & Notes		special Notes
BA: 8 BT: SSMB BN: OBA SSMB 2 SS: OBA	DCM		Special Conditions		
			I2C: OBA B4		
	SM1	Optical Bench Focus Stepper	I2C: OBA B6	Back home sensor: Ana In 0	
	SM2				
	SCN	Optical Bench sensors	I2C: OBA D2	Functions assigned and controlled as detailed below	
		Analog inputs & Opto LEDs	Ana In	Sts LED	
		OBA Focus Home sensor	0 (A19)	0	
			1 (B19)	1	
			2 (C19)	2	
		OBA thermistor #1	3 (A20)	3	
		OBA thermistor #2	4 (B20)	4	
		Code ID	5 (C20)	5	
		OBA thermistor #3	6 (A21)	6	
			7 (B21)	7	
		+24V Outputs	+24V Out	Dty Cyc	
		+24V Inputs	+24V In	Sts Bit	
		Digital Outputs	Dig Out	Dty Cyc	
		Digital Inputs	Dig In	Sts Bit	
		Stop All Motors	6 (B17)	6	Door Interlocks--activates if a door is open
		XSCAN	XSCAN		
Discrete Elements		Crash Detect	0 (B13)		
		Power SIC	I2C: HLB A6	(the Power SIC is not in the Cardage.)	

7. Electronics

Hardware Assignment Cross Reference

Item Name	Signal Name(s)	Item Category	Item Description	Cardage control element	Directly Connected SIC or Interface Bd
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DC Motors (with and without encoder)

Evacuation Pump	EVAC-PMP-M+,...M-	DC gearmotor w/encoder	Evacuation Peri Pump.	MSCB1, M1	Backplane, J17
spare motor drive		spare DC motor/encoder	Spare pwm dc motor control	MSCB1, M2	
Cannula Pump	CANNULA-PMP-M+,...M-	DC gearmotor w/encoder	Cannula Peri Pump.	MSCB3, M1	Backplane, J22
Sheath Pump	SHEATH-PMP-M+,...M-	DC gearmotor w/encoder	Sheath Peri Pump.	MSCB3, M2	Backplane, J23
SPA Vertical	VERT-MOT+, VERT-MOT-	DC gearmotor w/encoder	SPA Vertical Motor.	MSCB2, M1	SPA SIC, J3
SPA Rotation	ROT-MOT+, ROT-MOT-	DC gearmotor w/encoder	SPA Rotational Motor.	MSCB2, M2	SPA SIC, J4
STM Input Bufer	INPUT-BUF-MOT+, ...MOT-	DC motor, no encoder	Akray input (right side) belt DC motor.	MSCB4, M1	STM SIC, J02
STM Output Buffer	OUTPUT-BUF-MOT+, ...MOT-	DC motor, no encoder	Akray output (left side) belt DC motor.	MSCB4, M2	STM SIC, J02
spare motor drive		spare DC motor/encoder	Spare pwm dc motor control	SSMB1, DCM	
spare motor drive		spare DC motor/encoder	Spare pwm dc motor control	SSMB2, DCM	

Motor Encoders

Evacuation Pump	EVAC-PMP-ENC-A,...B	DC gearmotor encoder	Evacuation Peri Pump Motor encoder.	MSCB1, M1	Backplane, J17
spare encoder		DC gearmotor encoder	Spare pwm dc motor control	MSCB1, M2	
Cannula Pump	CANNULA-PMP-ENC-A,...B	DC gearmotor encoder	Cannula Peri Pump.	MSCB3, M1	Backplane, J22
Sheath Pump	SHEATH-PMP-ENC-A,...B	DC gearmotor encoder	Sheath Peri Pump.	MSCB3, M2	Backplane, J23
SPA Vertical	VERT-ENC-A,...B	DC gearmotor encoder	SPA Vertical Motor.	MSCB2, M1	SPA SIC, J3
SPA Rotation	ROT-ENC-A,...B	DC gearmotor encoder	SPA Rotational Motor.	MSCB2, M2	SPA SIC, J4
spare encoder		DC gearmotor encoder	Spare pwm dc motor control	SSMB1, M	
spare encoder		DC gearmotor encoder	Spare pwm dc motor control	SSMB2, M	

Stepper Motors

STM Measurement	INBRD-STPR-MOT-P1+,...P1- J20-SM1+24V	Uni-polar stepper motor	Akray "inner" linear motion	SSMB1, SM1	STM SIC, J02
STM Move out	INBRD-STPR-MOT-P2+,...P2- OUTBRD-STPR-MOT-P1+,...P1- J20-SM2+24V	Uni-polar stepper motor	Akray "outer" linear motio	SSMB1, SM2	STM SIC, J02
OBA focus	FSM-P1+,...P1- J14-SM1+24V	Bi-polar stepper motor	OBA focus stepper motor	SSMB2, SM1	OBA SIC, J2
spare	FSM-P2+,...P2-	spare Uni-polar stppr motor	Spare stepper motor drive	SSMB2, SM2	

Diaphragm Pumps

Air Pump	AIR-PUMP	DC brush diaphragm pump	Air pump	MSCB1, SCN, +24Vout 2	STM SIC, J3
Rinse Pump	RINSE-PUMP	DC brush diaphragm pump	Waste well sheath rinse supply pump	MSCB1, SCN, +24Vout 0	STM SIC, J5
Sheath Pump	SPR+24V-DRV	DC brush diaphragm pump	Sheath internal container refill pump	MSCB1, SCN, +24Vout 3	STM SIC, J6
Waste Pump	WASTE-PUMP	DC brush diaphragm pump	Waste well emptying pump	MSCB1, SCN, +24Vout 1	STM SIC, J4

7. Electronics

Item Name	Signal Name(s)	Item Category	Item Description	Cardcage control element	Directly Connected SIC or Interface Bd
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Valves (monitored)

BPV	DCVB2-V3H, ...V3L	Monitored valve		DCVB2, VLL1, VLV2	FSV SIC, J10
CBV	DCVB1-V5H, ...V5L	Monitored valve		DCVB1, VLL2, VLV1	FSV SIC, J6
CGV	DCVB1-V6H, ...V6L	Monitored valve		DCVB1, VLL2, VLV2	FSV SIC, J7
DRV	DCVB2-V2H, ...V2L	Monitored valve		DCVB2, VLL1, VLV1	FSV SIC, J9
EBV	DCVB2-V5H, ...V5L	Monitored valve	Evacuation Bypass Valve	DCVB2, VLL2, VLV1	FSV SIC, J12
PBV	DCVB2-V4H, ...V4L	Monitored valve	Pipette Bypass Valve	DCVB2, VLL2, VLV0	FSV SIC, J11
SBV	DCVB2-V1H, ...V1L	Monitored valve		DCVB2, VLL1, VLV0	FSV SIC, J8
spare	DCVB1-V2H, ...V2L	Monitored valve		DCVB1, VLL1, VLV1	FSV SIC, J3
spare	DCVB1-V3H, ...V3L	Monitored valve		DCVB1, VLL1, VLV2	FSV SIC, J4
spare	DCVB1-V4H, ...V4L	Monitored valve		DCVB1, VLL2, VLV0	FSV SIC, J5
spare	DCVB2-V6H, ...V6L	Monitored valve	spare valve	DCVB2, VLL2, VLV2	FSV SIC, J13
spare-rsrd	DCVB1-V1H, ...V1L	Monitored valve	hi-current drive reservd for stain valve	DCVB1, VLL1, VLV0	FSV SIC, J2

Analog Inputs

Air storage pressure	AIR-BUF-PSSR	Pressure Xcdr Output	Air storage bottle pressure	MSCB1, SCN, Ana In 4	Do-All SIC, J2
Air storage pressure	AIR-BUF-PSSR	Pressure Xcdr Output	Air storage bottle pressure	MSCB3, SCN, Ana In 4	Do-All SIC, J2
Cannula Pump Home PQ	CANNULA-PMP-HOME-PQ	Phototransistor output	Cannula Pump home phototransistor	MSCB3, SCN, Ana In 0	Cannula Pmp Pmp SIC
Cardcage thermistor	(10K thermistor on bkpin)	thermist on backplane	Thermistor for cardcage temperature	SSMB1, SCN, Ana In 6	backplane
Code ID	(+5V drctly to bkpin input pin)	hardwired +5V on bkpin	Logic signal to indicate FM1.5 and up	SSMB1, SCN, Ana In 5	backplane
Code ID	(+5V drctly to bkpin input pin)	hardwired +5V on bkpin	Logic signal to indicate FM1.5 and up	SSMB2, SCN, Ana In 5	backplane
Evac Pmp Home PQ	EVAC-PMP-HOME-PQ	Phototransistor output	Evac pump home phototransistor	MSCB1, SCN, Ana In 0	Evac Pmp Pmp SIC
Front stepper home sensor	STM-RTN-HOME	5V digital input	STM digitized measurement snsr home	SSMB1, SCN, Ana In 3	STM SIC, J01
Fuse 10 monitor J11 +24V	J11+24VM	Fuse monitor via divider	Fuse 10 monitor J11 +24V	MSCB2, SCN, Ana In 12	backplane
Fuse 12 monitor J18 +24V	J18+24VM	Fuse monitor via divider	Fuse 11 monitor J18 +24V	MSCB3, SCN, Ana In 13	backplane
Fuse 12 monitor J18 +5V	J18+5VM	Fuse monitor via divider	Fuse 12 monitor J18 +5V	MSCB3, SCN, Ana In 12	backplane
Fuse 13 monitor J11 +5V	J11+5VM	Fuse monitor via divider	Fuse 13 monitor J11 +5V	MSCB2, SCN, Ana In 11	backplane
Fuse 14 monitor J21 +24V	J21+24VM	Fuse monitor via divider	Fuse 14 monitor J21 +24V	MSCB3, SCN, Ana In 15	backplane
Fuse 15 mon J14 Stpr 1 +24V	J14-SM1+24VM	Fuse monitor via divider	Fuse 15 monitor J14 stppr motor 1 +24V	MSCB4, SCN, Ana In 10	backplane
Fuse 17 monitor J12 +5V	J12+5VM	Fuse monitor via divider	Fuse 17 monitor J12 +5V	MSCB2, SCN, Ana In 13	backplane
Fuse 18 monitor J13 +5V	J13+5VM	Fuse monitor via divider	Fuse 18 monitor J13 +5V	MSCB2, SCN, Ana In 14	backplane
Fuse 19 monitor J12 +24V	J12+24VM	Fuse monitor via divider	Fuse 19 monitor J12 +24V	MSCB3, SCN, Ana In 11	backplane
Fuse 20 monitor J17 +5V	J12+5VM	Fuse monitor via divider	Fuse 20 monitor J17 +5V	MSCB3, SCN, Ana In 11	backplane
Fuse 21 monitor J24 +24V	J24+24VM	Fuse monitor via divider	Fuse 21 monitor J24 +24V	MSCB3, SCN, Ana In 13	backplane

7. Electronics

Item Name	Signal Name(s)	Item Category	Item Description	Cardcage control element	Directly Connected SIC or Interface Bd
Analog Inputs (cont)					
Fuse 22 monitor J16 +5V	J16+5VM	Fuse monitor via divider	Fuse 22 monitor J16 +5V	MSCB2, SCN, Ana In 10	backplane
Fuse 23 mon J16 STB +24V	J16-STB+24VM	Fuse monitor via divider	Fuse 24 monitor J16 strobe +24V	MSCB3, SCN, Ana In 10	backplane
Fuse 24 mon J16 CAM +24V	J16-CAM+24VM	Fuse monitor via divider	Fuse 24 monitor J16 camera +24V	MSCB3, SCN, Ana In 9	backplane
Fuse 25 monitor J10 +5V	J10+5VM	Fuse monitor via divider	Fuse 25 monitor J10 +5V	MSCB2, SCN, Ana In 9	backplane
Fuse 3 monitor J19 +5V	J19+5VM	Fuse monitor via divider	Fuse 3 monitor J19 +5V	MSCB3, SCN, Ana In 14	backplane
Fuse 4 mon J20 Stppr 1 +24V	J20-SM1+24VM	Fuse monitor via divider	Fuse 4 monitor J20 stppr motor 1 +24V	MSCB4, SCN, Ana In 4	backplane
Fuse 5 mon J20 Stppr 2 +24V	J20-SM2+24VM	Fuse monitor via divider	Fuse 5 monitor J20 stppr motor 2 +24V	MSCB4, SCN, Ana In 5	backplane
Fuse 6 monitor J23 +5V	J23+5VM	Fuse monitor via divider	Fuse 6 monitor J23 +5V	MSCB3, SCN, Ana In 8	backplane
Fuse 7 monitor J22 +5V	J22+5VM	Fuse monitor via divider	Fuse 7 monitor J22 +5V	MSCB3, SCN, Ana In 7	backplane
Fuse 8 monitor J21 +5V	J21+5VM	Fuse monitor via divider	Fuse 8 monitor J21 +5V	MSCB3, SCN, Ana In 6	backplane
Fuse 9 monitor J14 +5V	J14+5VM	Fuse monitor via divider	Fuse 9 monitor J14 +5V	MSCB2, SCN, Ana In 15	backplane
Main chassis thermistor	(10K thermistor on bckpln)	thermistor on backplane	Thrmstr for main chassis temperature	SSMB1, SCN, Ana In 7	backplane
Mismrnt stepper home sensor	STM-MSR-HOME	5V digital input	STM digitized measurement snsr home	SSMB1, SCN, Ana In 2	STM SIC, J01
OBA thermistor #1	FH-PQ	Opto-transistor output	OBA Focus Home phototransistor	SSMB2, SCN, Ana In 0	OBA SIC, J12
OBA thermistor #2	OBA-THERM1	Thermistor to GND	OBA mechanism thermistor	SSMB2, SCN, Ana In 3	OBA SIC, J6
OBA thermistor #3	OBA-THERM2	Thermistor to GND	OBA mechanism thermistor	SSMB2, SCN, Ana In 4	OBA SIC, J6
Pipette arm Rotation Home	OBA-THERM3	Thermistor to GND	OBA mechanism thermistor	SSMB2, SCN, Ana In 6	OBA SIC, J6
Pipette arm Rotation limit	ROT-HOME-PQ	Opto-transistor output	SPA rotatn position home (back sensor)	MSCB2, SCN, Ana In 1	SPA SIC, J10
Pipette arm Vertical bottom	ROT-FRT-LIM-PQ	Opto-transistor output	SPA rotatn position limit (front sensor)	MSCB2, SCN, Ana In 3	SPA SIC, J10
Pipette arm Vertical Home	VERT-LWR-LIM-PQ	5V lever switch output	SPA vert position home (top of travel)	MSCB2, SCN, Ana In 5	SPA SIC, J16
Sheath Container Overflow	VERT-HOME-PQ	Opto-transistor output	SPA vert position home (top of travel)	MSCB2, SCN, Ana In 0	SPA SIC, J10
Sheath Container Sensor	SHEATH-OVRFLW	5V Digital input	Sheath Ovrflw sw. (Not used here)	HLCB, FQM, Ana In 1	Rear Panel SIC, J4
Sheath Pump Home PQ	SHEATH-SIGNAL	5V Analog input	8-level sig frm intrnl Sheath Cntrlr Assy	HLCB, FQM, Ana In 0	Rear Panel SIC, J4
Soft Crash	SHEATH-PMP-HOME-PQ	Phototransistor output	Sheath Pump home phototransistor	MSCB3, SCN, Ana In 1	Sheath Pmp Pmp SIC
spare pssr signal	SOFT-CRSH!	5V lever switch output	SPA soft crash switch	MSCB2, SCN, Ana In 4	SPA SIC, J5
spare pssr signal	SPR-PSSR-1	Pressure Xdcr Output	spare pressure xdcr signal	MSCB1, SCN, Ana In 6	Do-All SIC, J2
spare pssr signal	SPR-PSSR-1	Pressure Xdcr Output	spare pressure xdcr signal	MSCB3, SCN, Ana In 6	Do-All SIC, J2
spare pssr signal	SPR-PSSR-2	Pressure Xdcr Output	spare pressure xdcr signal	MSCB1, SCN, Ana In 7	Do-All SIC, J2
spare pssr signal	SPR-PSSR-2	Pressure Xdcr Output	spare pressure xdcr signal	MSCB3, SCN, Ana In 7	Do-All SIC, J2
spare pssr signal	STAIN-PSSR	Pressure Xdcr Output	spare pressure xdcr signal	MSCB1, SCN, Ana In 5	Do-All SIC, J2
spare pssr signal	STAIN-PSSR	Pressure Xdcr Output	spare pressure xdcr signal	MSCB3, SCN, Ana In 5	Do-All SIC, J2
STD signal	STD-PQ	Phototransistor output	STD phototransistor	MSCB4, SCN, Ana In 0	STM SIC, J9

7. Electronics

Item Name	Signal Name(s)	Item Category	Item Description	Cardcage control element	Directly Connected SIC or Interface Bd
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OLED Drives

Cannula Pmp Home Opto-LED	CANNULA-PMP-HOME-OLED	Opto-LED drive input	Cannula Pump home opto-LED	MSCB3, SCN, OLED 0	Cannula Pmp Pmp SIC
Evac Pmp Home Opto-LED	EVAC-PMP-HOME-OLED	Opto-LED drive input	Evac pump home opto-LED	MSCB1, SCN, OLED 0	Evac Pmp Pmp SIC
OBA Focus Home Opto-LED	FH-OLED	Opto-LED drive input	OBA Focus Home opto-LED	SSMB2, SCN, OLED 0	OBA SIC, J12
Sheath Pmp Home Opto-LED	SHEATH-PMP-HOME-OLED	Opto-LED drive input	Sheath Pump home opto-LED	MSCB3, SCN, OLED 1	Sheath Pmp Pmp SIC
SPA arm Rot Home Opto-LED	ROT-HOME-OLED	Opto-LED drive input	SPA rot pos hm (bck sensor) opto-LED	MSCB2, SCN, OLED 1	SPA SIC, J10
SPA arm Rot limit Opto-LED	ROT-FRT-LIM-OLED	Opto-LED drive input	SPA rot pos lim (frnt sensor) opto-LED	MSCB2, SCN, OLED 3	SPA SIC, J10
SPA arm Vert Home Opto-LED	VERT-HOME-OLED	Opto-LED drive input	SPA vert pos hm (top of trav) opto-LED	MSCB2, SCN, OLED 0	SPA SIC, J10
STD signal Opto-LED	STD-OLED	Opto-LED drive input	STD opto-LED	MSCB4, SCN, OLED 0	STM SIC, J9

Digital Outputs

Carrier ID address 0	CID-ADR0	5V digital output	Arkay STM tray ID reader addr 0	MSCB4, SCN, Dig Out 0	STM SIC, J01
Carrier ID address 1	CID-ADR1	5V digital output	Arkay STM tray ID reader addr 1	MSCB4, SCN, Dig Out 1	STM SIC, J01
Carrier ID address 2	CID-ADR2	5V digital output	Arkay STM tray ID reader addr 2	MSCB4, SCN, Dig Out 2	STM SIC, J01
Crash relay reset pulse	SPA-VERT-EN	5V digital output	SPA vertical crash relay reset pulse	MSCB2, SCN, Dig Out 0	SPA SIC
Downstream output signal	SM-DS-OUT	5V digital output	Handshake signal to downstream unit	MSCB4, SCN, Dig Out 3	Rear Panel SIC, J3
ESN Rly Ctrl Bit 0	GRP-CTL0!	5V digital output	ESN group relay control, bit 0	HLCB, MST, CTL0	Do-All SIC
ESN Rly Ctrl Bit 1	GRP-CTL1!	5V digital output	ESN group relay control, bit 1	HLCB, MST, CTL1	Do-All SIC
ESN Rly Ctrl Bit 2	GRP-CTL2!	5V digital output	ESN group relay control, bit 2	HLCB, MST, CTL2	Do-All SIC
Pause Sw grn LED	XLED0	5V digital output	Pause Switch, green LED, 0V = on	HLCB, FQM, XLED 0	SM Status Bd.
Pause Sw red LED	XLED1	5V digital output	Pause Switch, red LED, 0V = on	HLCB, FQM, XLED 1	SM Status Bd.
SM Status blue LEDs	XLED4	5V digital output	blue "measure" status LEDs, 0V = on	HLCB, FQM, XLED 4	SM Status Bd.
SM Status green LEDs	XLED3	5V digital output	green "standby" status LEDs, 0V = on	HLCB, FQM, XLED 3	SM Status Bd.
SM Status red LEDs	XLED2	5V digital output	red "error" status LEDs, 0V = on	HLCB, FQM, XLED 2	SM Status Bd.
Supply downstream power	SUPPLY-DS-PWR	5V digital output	Control sig to enable downstream +24V	SSMB1, SCN, Dig Out 2	Rear Panel SIC, J3
Supply upstream power	SUPPLY-US-PWR	5V digital output	Control signal to enable upstream +24V	SSMB1, SCN, Dig Out 0	Rear Panel SIC, J2
Upstream output signal	SM-US-OUT	5V digital output	Handshake signal to upstream unit	MSCB4, SCN, Dig Out 4	Rear Panel SIC, J2
Upstrm/Dwnstrm reset	ARKRAY-RST	5V digital output	Control reset signal to Arkay units	SSMB1, SCN, Dig Out 3	Rear Panel SIC, J2 & J3

7. Electronics

Item Name	Signal Name(s)	Item Category	Item Description	Cardcage control element	Directly Connected SIC or Interface Bd
Digital Inputs					
Cannula pmp cover in place	CANNULA-PMP-CVR-IN-PLC	5V lever switch input	Evac pump door sense switch	MSCB3, SCN, Dig In 1	Cannula Pmp Pmp SIC
Cannula pmp csstet in place	CANNULA-PMP-CSST-IN-PLC	5V lever switch input	Evac pump cassette sense switch	MSCB3, SCN, Dig In 0	Cannula Pmp Pmp SIC
Carrier ID Selected Signal		5V digital input	Signal addressed by CID-ADDR0..2	MSCB4, SCN, Dig In 0	STM SIC, J01
Crash Notice	CRASH!	XSCAN digital input	Crash signal from any Scanner	MSCB1, SCN, XSCAN 0	on backplane
Crash Notice	CRASH!	XSCAN digital input	Crash signal from any Scanner	MSCB2, SCN, XSCAN 0	on backplane
Crash Notice	CRASH!	XSCAN digital input	Crash signal from any Scanner	MSCB3, SCN, XSCAN 0	on backplane
Crash Notice	CRASH!	XSCAN digital input	Crash signal from any Scanner	MSCB4, SCN, XSCAN 0	on backplane
Crash Notice	CRASH!	XSCAN digital input	Crash signal from any Scanner	SSMB1, SCN, XSCAN 0	on backplane
Crash Notice	CRASH!	XSCAN digital input	Crash signal from any Scanner	SSMB2, SCN, XSCAN 0	on backplane
Downstream input signal	SM-DS-IN!	5V digital input	Hndshk signal from downstream unit	MSCB4, SCN, Dig In 1	Rear Panel SIC, J3
Evac pump cassette in place	EVAC-PMP-CSST-IN-PLC	5V lever switch input	Evac pump cassette sense switch	MSCB1, SCN, Dig In 0	Evac Pmp Pmp SIC
Evac pump cover in place	EVAC-PMP-CVR-IN-PLC	5V lever switch input	Evac pump door sense switch	MSCB1, SCN, Dig In 1	Evac Pmp Pmp SIC
Pause Switch	FP-SW!	5V manual switch input	SM "Pause" switch, 0V = switch prssd	MSCB1, SCN, Xsw-In 0	SM Status Bd.
Sheath Cntr Ovrflow	SHEATH-OVRFLW	5V float-switch input	Sheath Ovrflw sw. +5V = Overflow	MSCB1, SCN, Dig In 2	Rear Panel SIC, J4
Sheath pmp cover in place	SHEATH-PMP-CVR-IN-PLC	5V lever switch input	Sheath pump door sense switch	MSCB3, SCN, Dig In 1	Sheath Pmp Pmp SIC
Sheath pmp csstet in place	SHEATH-PMP-CSST-IN-PLC	5V lever switch input	Sheath pump cassette sense switch	MSCB3, SCN, Dig In 0	Sheath Pmp Pmp SIC
spare +5V in #1	SPR-DIGIN-1	5V digital input	soare input for FITD-type 5V signal	MSCB2, SCN, Dig In 0	Do-All SIC, J10
spare +5V in #2	SPR-DIGIN-2	5V digital input	soare input for FITD-type 5V signal	MSCB2, SCN, Dig In 1	Do-All SIC, J11
spare +5V in #3	SPR-DIGIN-3	5V digital input	soare input for FITD-type 5V signal	MSCB2, SCN, Dig In 2	Do-All SIC, J12
spare FITD	STAIN-OUT-FITD	spare FITD driven 5V input	spare FITD input -- was STAIN-OUT	MSCB1, SCN, Dig In 3	Do-All SIC, J7
Specimen FITD	SPECIMEN-FITD	FITD driven 5V input	Specimen sensing FITD	MSCB1, SCN, Dig In 4	Do-All SIC, J8
Specimen FITD	SPECIMEN-FITD	5V digital input	Specimen FITD liquid sense	MSCB3, SCN, Dig In 4	Do-All SIC, J8
Stop All Motors	ALL-MOTORS-STO!	5V switch input	Stop All Motors signal	MSCB1, SCN, Dig In 6	SM Status Bd.
Stop All Motors	ALL-MOTORS-STO!	5V switch input	Stop All Motors signal	MSCB2, SCN, Dig In 6	SM Status Bd.
Stop All Motors	ALL-MOTORS-STO!	5V switch input	Stop All Motors signal	MSCB3, SCN, Dig In 6	SM Status Bd.
Stop All Motors	ALL-MOTORS-STO!	5V switch input	Stop All Motors signal	MSCB4, SCN, Dig In 6	SM Status Bd.
Stop All Motors	ALL-MOTORS-STO!	5V switch input	Stop All Motors signal	SSMB1, SCN, Dig In 6	SM Status Bd.
Stop All Motors	ALL-MOTORS-STO!	5V switch input	Stop All Motors signal	SSMB2, SCN, Dig In 6	SM Status Bd.
Upstream input signal	SM-US-IN!	5V digital input	Hndshk signal from upstream unit	MSCB4, SCN, Dig In 2	Rear Panel SIC, J2
Waste Well FITD	WST-WELL-FITD	FITD driven 5V input	Waste Well Overflow sense FITD	MSCB1, SCN, Dig In 5	Do-All SIC, J9
Waste well FITD	WST-WELL-FITD	5V digital input	Waste well level FITD liquid sense	MSCB3, SCN, Dig In 5	Do-All SIC, J9

7. Electronics

Item Name	Signal Name(s)	Item Category	Item Description	Cardcage control element	Directly Connected SIC or Interface Bd
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+24V Outputs

Cardcage cooling fan	CARD-CAGE-FAN-DRV	+24V output	Supplies +24V to cardcage cooling fan	SSMB1, SCN, +24Vout 0	Backplane, J24
Diaphragm pump +24V output drives, see "Diaphragm Pumps" subheading					
Main chassis cooling fan	MAIN-CHASSIS-FAN-DRV	+24V output	Supplies +24V to main chassis cooling fan	SSMB1, SCN, +24Vout 1	Backplane, J25
spare +24V drive	24V-DRV1	+24V output	spare open-drain 24V drive.	MSCB3, SCN, +24Vout 4	FSV SIC, J14
spare +24V drive	24V-DRV1	+24V output	spare open-drain 24V drive.	MSCB2, SCN, +24Vout 4	FSV SIC, J14
spare +24V drive	24V-DRV2	+24V output	spare open-drain 24V drive.	MSCB3, SCN, +24Vout 5	FSV SIC, J15
spare +24V drive	24V-DRV2	+24V output	spare open-drain 24V drive.	MSCB2, SCN, +24Vout 5	FSV SIC, J15
spare +24V drive	24V-DRV3	+24V output	spare open-drain 24V drive.	MSCB3, SCN, +24Vout 6	FSV SIC, J16
spare +24V drive	24V-DRV3	+24V output	spare open-drain 24V drive.	MSCB2, SCN, +24Vout 6	FSV SIC, J16
spare +24V drive	SPR_24V-DRV1	+24V output	spare open-drain 24V drive.	MSCB3, SCN, +24Vout 2	Do-All SIC, J15
spare +24V drive	SPR_24V-DRV1	+24V output	spare open-drain 24V drive.	MSCB2, SCN, +24Vout 2	Do-All SIC, J15
spare +24V drive	SPR_24V-DRV2	+24V output	spare open-drain 24V drive.	MSCB3, SCN, +24Vout 3	Do-All SIC, J16
spare +24V drive	SPR_24V-DRV2	+24V output	spare open-drain 24V drive.	MSCB2, SCN, +24Vout 3	Do-All SIC, J16
spare +24V drive	SPR+24V-DRV	+24V output	spare open-drain 24V drive.	MSCB3, SCN, +24Vout 7	STM SIC, J6
spare +24V drive	SPR+24V-DRV	+24V output	spare open-drain 24V drive.	MSCB1, SCN, +24Vout 3	STM SIC, J6
spare +24V drive	SPV-VLV	+24V output	spare open-drain 24V drive.	MSCB3, SCN, +24Vout 0	Do-All SIC, J13
spare +24V drive	SPV-VLV	+24V output	spare open-drain 24V drive.	MSCB2, SCN, +24Vout 0	Do-All SIC, J13
spare +24V drive	SVV-VLV	+24V output	spare open-drain 24V drive.	MSCB3, SCN, +24Vout 1	Do-All SIC, J14
spare +24V drive	SVV-VLV	+24V output	spare open-drain 24V drive.	MSCB2, SCN, +24Vout 1	Do-All SIC, J14

+24V Inputs

Code ID, MSCB1	(10K resistor to +24V)	+24V logic input	"I" Tells PIC if FM1.5 and up.	MSCB1, SCN, +24V In 0	Backplane
Code ID, MSCB2	(10K resistor to +24V)	+24V logic input	"I" Tells PIC if FM1.5 and up.	MSCB2, SCN, +24V In 0	Backplane
Code ID, MSCB3	(10K resistor to +24V)	+24V logic input	"I" Tells PIC if FM1.5 and up.	MSCB3, SCN, +24V In 0	Backplane
Code ID, MSCB4	(10K resistor to +24V)	+24V logic input	"I" Tells PIC if FM1.5 and up.	MSCB4, SCN, +24V In 0	Backplane

7. Electronics

ESN I2C Addresses

#	ESN Item	I2C addr	Fixed I2C	Group 0				Group 1				Group 2				Group 3				Group 4				Group 5				Group 6				Group 7																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
				0	2	4	8	A	C	E	0	2	4	8	A	C	E	0	2	4	8	A	C	E	0	2	4	8	A	C	E	0	2	4	8	A	C	E																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
1	SPA SIC ESN	G0-A0	1																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		

7. Electronics

Total Existing Electrical Hardware ESNs:	30
Total Tethered ESNs	9
Total Option (Spare) ESNs	13
Unusable ESNs	1
Total unassigned ESNs	11
Total ESNs, all categories	64

Legend:

	unused
1	used
	unusable

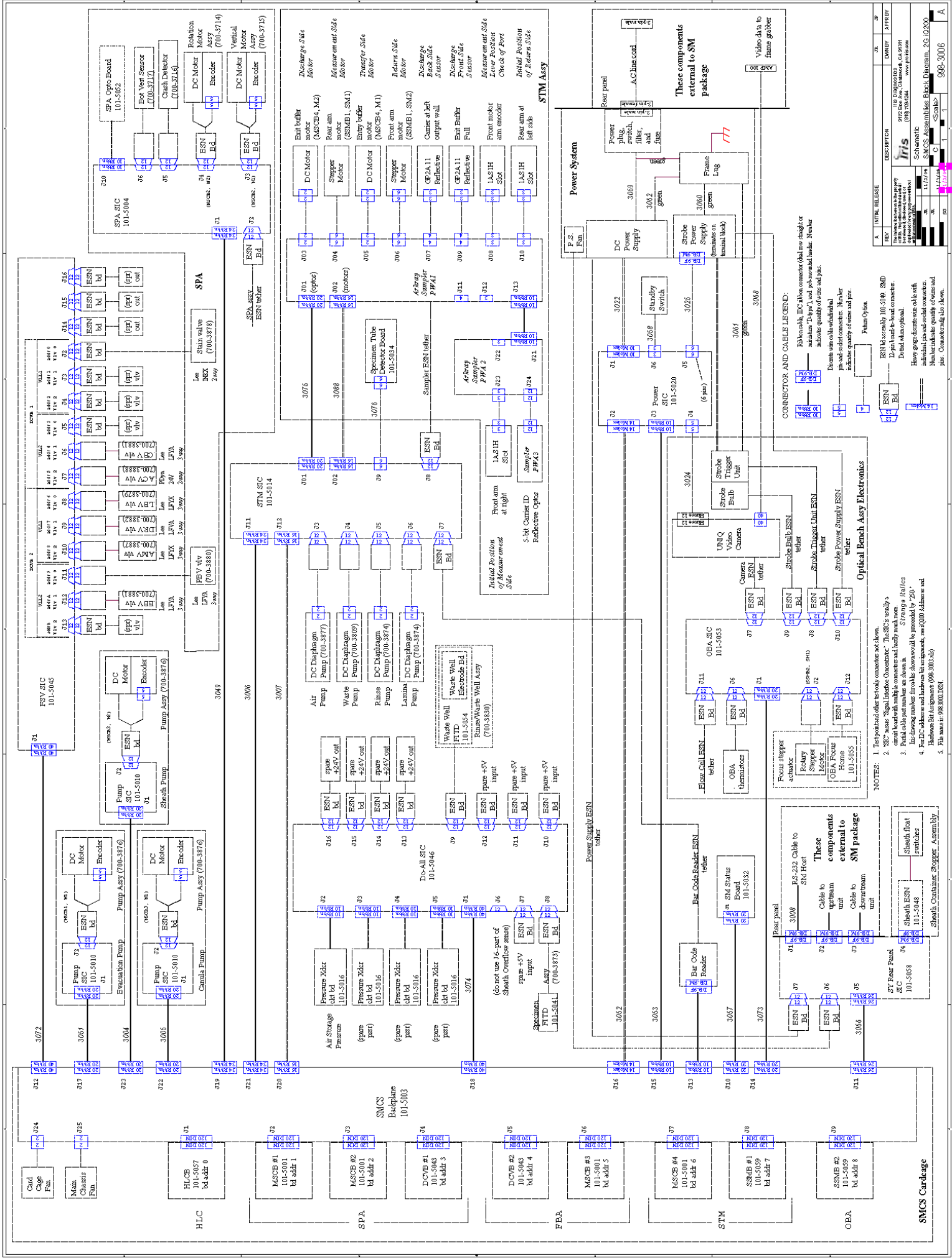
8

Schematics

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8. Schematics

998-3006 SM SMCS Assemblies Block Diagram

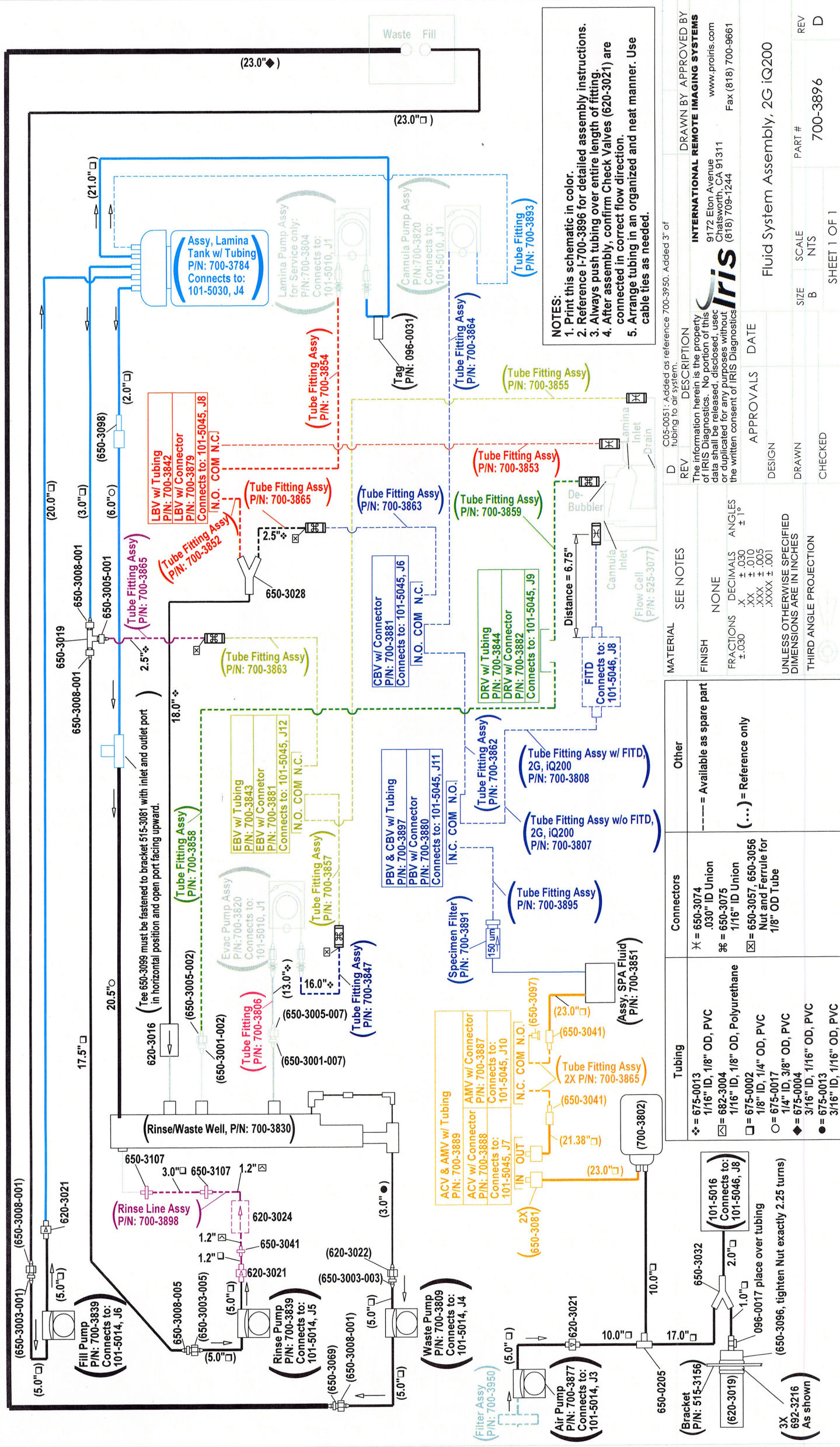


8. Schematics

700-3800 System Fluid Assembly

Diagram drawings may change without notice. Please contact IRIS Diagnostics to determine the current revision level.

IRIS Diagnostics
9172 Eton Ave
Chatsworth, Ca 91311
Ph# 818-709-1244



8. Schematics

Master Controller State records

State Index	State	SPAcmd	FBAcmd	STMcmd	OBACmd	SPAcstat	FBAstat	STMstat	OBAsat	SMTstat	ToSM	Tvalue	Tfunc	Sens	End	Bran	Dest
0		0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000	0	0X0007	0X43	0X0032	0X0000	0X0101	0X5738
1	Reset High	RE	RE	RE	RE	0XFF	0XFF	0XFF	0XFF	0X0000	0	0X0008	0X44	0X0000	0XCE4E	0X0000	0X0000
2	Start Lamina bottle fill	S1	0X0000	0X0000	0X0000	0X32	0X00	0X00	0X00	0X0000	0	0x0009	0x44	0x0000	0x0002	0x0000	0X0000
3	Wait for S1 idle and Lamina bottle full, or timeout	0X0000	0X0000	0X0000	0X0000	0XFF	0X00	0X00	0X00	0X0000	0	0x0005	0x42	0x0033	0X8303	0X0000	0X0000
4	Turn off Lamina pump	S0	0X0000	0X0000	0X0000	0X33	0X00	0X00	0X00	0X0000	0	0x0009	0x44	0X0000	0X0002	0X0000	0X0000
5	Wait for S0 idle	0X0000	0X0000	0X0000	0X0000	0XFF	0X00	0X00	0X00	0X0000	0	0X0000	0X00	0X0000	0x0002	0X0000	0X0000
6	Test Lamina low sense condition	0X0000	0X0000	0X0000	0X0000	0X00	0x00	0X00	0X00	0X0000	0	0X0000	0X00	0X0032	0X8001	0X0001	8
7	Lamina sense is ok, send message ToSM	0X0000	0X0000	0X0000	0X0000	0X00	0x00	0x00	0x00	0X0000	0x1F	0x0000	0x00	0X0000	0x0000	0x0101	11
8	Test Lamina empty sense condition	0X0000	0X0000	0X0000	0X0000	0X00	0x00	0X00	0X00	0X0000	0	0X0000	0X00	0X0032	0X8001	0X0001	10
9	Lamina sense is low, send message ToSM	0X0000	0X0000	0X0000	0X0000	0X00	0x00	0x00	0x00	0X0000	0x20	0x0000	0x00	0X0000	0x0000	0x0101	11
	Lamina sense is empty, send message ToSM, branch to "Clear Rack"	0X0000	0X0000	0X0000	0X0000	0X00	0x00	0x00	0x00	0X0000	0x21	0x0000	0x00	0X0000	0x0000	0x0101	0x3045
10	Start 3 Funcs: PH, CR, HS	PH	AC	CR	0x0000	0x00	0X21	0X00	0x00	0X0000	0	0x0009	0x44	0X0000	0X005F	0X0000	0X0000
11	Wait for SPA, FBA, and STM idle	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0xFF	0X00	0X0000	0	0x0011	0x44	0X0000	0x8E0E	0X0000	0X0000
12	Turn off waste pump	LO	0X0000	0X0000	0X0000	0x35	0x00	0X00	0X00	0X0000	0	0x0009	0x44	0X0000	0X001F	0X0000	0X0000
13		0X0000	0X0000	0X0000	0X0000	0xFF	0x00	0X00	0X00	0X0000	0	0x0011	0x44	0X0000	0X001F	0X0000	0X0000
14	End RH	0X0000	0X0000	0X0000	0x0000	0X00	0X00	0X00	0X00	0X0000	0	0X0000	0X00	0X0000	0X001F	0X0000	0X0000
15	Beginning of GO command; Tell SM to disable inter-message delays (inter-message delays were required for older state records)	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000	0x39	0x0000	0x00	0x0000	0x0101	0X0000	0X0000
16	Ask SM if we can start Wait for SM reply, whose argument indicates whether to proceed	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000	0x82	0x000F	0x44	0x6001	0x001F	0X0000	0X0000
17	If SM replies '00' branch to CANNOT_GO; else fall through	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X3030	0xFD	0X0000	0X00	0X0000	0X0101	0X0020	102
18	Reset HLCs	RE	RE	RE	RE	0XFF	0XFF	0XFF	0XFF	0X0000	0	0X0010	0x44	0x6000	0XCA4A	0X0000	0X0000
19	Set front panel lights (button green, LED blue)	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0XFF	0X00	0X0000	0	0X0000	0X00	0X6000	0X005F	0X0000	0X0000
20	Tell STM to find first rack, FBA sets CP and SP to initial positions, SPA Initializes Pipette position, sets EP to initial position.	P0	HP	M1	0X0000	0x12	0X00	0X00	0X00	0X0000	0	0x0009	0x44	0X0000	0x001F	0X0000	0X0000
21	If STM idle (rack found as a result of M1) goto HaveRack	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0xFF	0X00	0X0000	0	0X0000	0X00	0X0000	0X0101	0X0008	25
22	No rack found -- branch to EndGoBranch	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X39	0X00	0X0000	0	0X0000	0X00	0X0000	0X0101	0X0008	100
23	Loop while waiting for STM status	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000	0	0X0000	0X00	0X0000	0X001F	0X0101	22
24	Retrieve stored tube detect value; branch to "Wait for Sample..." if 0	0X0000	0X0000	0X070A	0X0000	0X00	0X00	0x00	0X00	0X0000	0x32	0x0014	0x44	0X0000	0X0101	0X0008	30
25	Have Rack	0X0000	0X0000	0X0709	0X0000	0X00	0X00	0x00	0X00	0X0000	0	0x0015	0x44	0X0000	0X0101	0x0000	0X0000
26	Retrieve rack id	0X0000	0X0000	0X0708	0X0000	0X00	0X00	0x00	0X00	0X0000	0	0x0013	0x44	0X0000	0X0101	0x0000	0X0000
27	Retrieve tube number (of first tube in rack).	0X0000	0X0000	0X0707	0X0000	0X00	0X00	0X00	0X00	0X0000	0	0x0016	0x44	0X0000	0X0101	0X0000	0X0000
28	Retrieve tube id (bar code)	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X3032	0X81	0x0017	0x44	0X0000	0X001F	0X0000	0X0000
29	Get sample info from host	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000	0	0x0017	0x44	0X0000	0X001F	0X0000	0X0000

Diagram drawings may change without notice. Please contact IRIS Diagnostics to determine the current revision level.

IRIS Diagnostics
9172 Eton Ave
Chatsworth,
Ca 91311
Ph# 818-709-1244

8. Schematics

Master Controller State records

State Index	State	SPAcmd	FBAcmd	STMcmd	OBAcmd	SPAstat	FBAstat	STMstat	OBAsat	SMTest	ToSM	Tvalue	Tfunc	Sens	End	Bran	Dest
30	Wait for SPA and FBA idle Branch to new rack entry point	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0xFF	0X00	0X0000	0	0x0011	0x44	0X0000	0X0000	0x8E0E	#####
31	Beginning of Go Resume (16); Set front panel lights (button green, LED blue) If STM ready (next tube position or new rack) goto CheckTube	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000	0	0X0000	0X00	0X6000	0x0101	0X0000	0X0000
32	No rack -- Last Rack	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0xFF	0X00	0X0000	0	0X0000	0X00	0X0000	0X0101	0X0008	35
33	Loop while waiting for STM status	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X39	0X00	0X0000	0	0X0000	0X00	0X0000	0X0101	0X0008	99
34	Retrieve tube number, tell host we're alive; Fall through for new rack (tube = 1), branch to entry point for next tube otherwise	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000	0	0X0000	0X00	0X0000	0X001F	0X0101	32
35	Send rack completion signal to host	0X0000	0X0000	0X0708	0X0000	0X00	0X00	0x01	0X00	0X0000	0x32	0x0013	0x44	0X0000	0x0008	0x0808	48
36	Entry Point for new rack	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000	0x2F	0X0000	0X00	0X0000	0X0101	0X0000	0X0000
37	Start Lamina bottle fill	S1	0X0000	0X0000	0X0000	0X32	0X00	0X00	0X00	0X0000	0	0x0009	0x44	0x0000	0x0002	0x0000	0X0000
38	Wait for S1 idle and Lamina bottle full, or timeout	0X0000	0X0000	0X0000	0X0000	0xFF	0X00	0X00	0X00	0X0000	0	0x0005	0x42	0x0033	0X8303	0X0000	0X0000
39	Turn off Lamina pump	S0	0X0000	0X0000	0X0000	0X33	0X00	0X00	0X00	0X0000	0	0x0009	0x44	0X0000	0X0002	0X0000	0X0000
40	Wait for S0 idle	0X0000	0X0000	0X0000	0X0000	0xFF	0X00	0X00	0X00	0X0000	0	0x0011	0x44	0X0000	0x0002	0X0000	0X0000
41	Test Lamina low sense condition	0X0000	0X0000	0X0000	0X0000	0X00	0x00	0X00	0X00	0X0000	0	0X0000	0X00	0X0032	0X8001	0X0001	43
42	Lamina sense is ok, send message ToSM	0X0000	0X0000	0X0000	0X0000	0X00	0x00	0x00	0x00	0X0000	0x1F	0x0000	0x00	0X0000	0x0000	0x0101	46
43	Test Lamina empty sense condition	0X0000	0X0000	0X0000	0X0000	0X00	0x00	0X00	0X00	0X0000	0	0X0000	0X00	0X0032	0X8001	0X0001	45
44	Lamina sense is low, send message ToSM	0X0000	0X0000	0X0000	0X0000	0X00	0x00	0x00	0x00	0X0000	0x20	0x0000	0x00	0X0000	0x0000	0x0101	46
45	Lamina sense is empty, send message ToSM, branch to "Clear Rack"	0X0000	0X0000	0X0000	0X0000	0X00	0x00	0x00	0x00	0X0000	0x21	0x0000	0x00	0X0000	0x0000	0x0101	0x3045
46	Wait for SPA, FBA, and STM idle	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0xFF	0X00	0X0000	0	0x0011	0x44	0X0000	0x8E0E	0X0000	0X0000
47	Entry Point for new tube	0X0000	0X0000	0X0708	0X0000	0X00	0X00	0x00	0X00	0X0000	0x32	0x0013	0x44	0X0000	0X0101	0x0000	0X0000
48	Retrieve tube number, tell host we're alive; Retrieve stored tube detect value; branch to "Move to Next tube..." if 0	0X0000	0X0000	0X070A	0X0000	0X00	0X00	0x00	0X00	0X0000	0x32	0x0014	0x44	0X0000	0X0101	0X0008	82
49	Retrieve rack id; branch to "RQ" if 29	0X0000	0X0000	0X0709	0X0000	0X00	0X00	0x1D	0X00	0X0000	0	0x0015	0x44	0X0000	0X0101	0x0008	0x5251
50	If SM replies '00' (last sample info request), branch to "Move to Next tube..."	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X3030	0xF2	0X0000	0X00	0X0000	0X0101	0X0020	82
51	If SM replies '2' (last sample info request), branch to "0e" (Clear Rack)	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X2D32	0xF2	0X0000	0X00	0X0000	0X0101	0X0020	0x3045
52	Pipette down to test tube, Clean flow cell (initialize EP pump), Place SP on tube	P1	SH	0X0000	0X0000	0x11	0x00	0X00	0X00	0X0000	0	0x0009	0x44	0X0000	0X001F	0X0000	0X0000
53	Wait for SPA and FBA idle	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000	0	0x0011	0x44	0X0000	0x8606	0X0000	0X0000
54	Wait for "image processing idle"	0X0000	0X0000	0X0000	0X0000	0x00	0x00	0X00	0X00	0x3338	0x37	0X0000	0x00	0X0000	0X001F	0X0000	0X0000
55	Start Lamina for background capture	SB	0X0000	0X0000	0X0000	0x31	0X00	0X00	0X00	0X0000	0	0x0009	0x44	0X0000	0x001F	0X0000	0X0000
56	Capture background and wait for frame processing complete (future wait for frame capture complete).	0X0000	0X0000	0X0000	0X0000	0x00	0x00	0x00	0x00	0X3034	0X83	0x0009	0x44	0x0000	0x0010	0x0000	0X0000
57	Wait for SB complete	0X0000	0X0000	0X0000	0X0000	0xFF	0x00	0X00	0X00	0X0000	0	0x0011	0x44	0X0000	0X001F	0X0000	0X0000

Diagram drawings may change without notice. Please contact IRIS Diagnostics to determine the current revision level.

IRIS Diagnostics
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Chatsworth,
Ca 91311
Ph# 818-709-1244

8. Schematics

Master Controller State records

State Index	State	SPAcmd	FBAcmd	STMcmd	OBACmd	SPAstat	FBAstat	STMstat	OBAsat	SMTest	ToSM	Tvalue	Tfunc	Sens	End	Bran	Dest
58	Wait for "image processing idle"	0X0000	0X0000	0X0000	0X0000	0x00	0x00	0X00	0X00	0x3338	0x37	0X0000	0x00	0X0000	0X001F	0X0000	0X0000
59	Start aspiration for sample transfer	AS	RC	0X0000	0X0000	0x17	0x00	0X00	0X00	0X0000		0 0x0009	0x44	0X0000	0X001F	0X0000	0X0000
60	Wait for AS and RC complete	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000		0 0x0011	0x44	0X0000	0x8606	0X0000	0X0000
61	Test Lamina Full Sensor	0X0000	0X0000	0X0000	0X0000	0X00	0x00	0X00	0X00	0X0000		0 0X0000	0X00	0x0033	0x0101	0x0001	#####
	Timer delay before capture To waste well (with Lamina fill) Move to next tube	P4	0X0000	MN	0X0000	0x15	0x00	0x00	0x00	0X0000		0 0X0062	0x43	0X0000	0X0000	0x0000	64
	Timer delay before capture To waste well (no Lamina fill) Move to next tube	P2	0X0000	MN	0X0000	0x15	0x00	0x00	0x00	0X0000		0 0X0062	0x42	0X0000	0X0000	0x0000	0X0000
64	Initiate Sample frame capture.	0X0000	0X0000	0X0000	0X0000	0x00	0X00	0X00	0X00	0X0000	0X85	0x0000	0x00	0x0000	0x0101	0x0000	0X0000
	Wait for 6 second timeout or short sample detector.	0X0000	0X0000	0X0000	0X0000	0x00	0x00	0x00	0x00	0X0000		0 0x01cd	0x03	0x0032	0x0001	0x0000	67
66	Send "Short Sample" signal.	0X0000	0X0000	0X0000	0X0000	0x00	0x00	0x00	0x00	0X0000	0x31	0x0000	0x00	0x0000	0X0101	0x0000	0X0000
	If STM ready (next tube position or new rack) goto CheckTube	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0xFF	0X00	0X0000		0 0X0000	0X00	0X0000	0X0101	0X0008	70
68	No rack -- Last Rack	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X39	0X00	0X0000		0 0X0000	0X00	0X0000	0X0101	0X0008	75
	Loop while waiting for STM status	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000		0 0X0000	0X00	0X0000	0X001F	0X0101	67
	Retrieve stored tube detect value; branch to "Wait for Sample..." if 0	0X0000	0X0000	0X070A	0X0000	0X00	0X00	0x00	0X00	0X0000	0x32	0x0014	0x44	0X0000	0X0101	0X0008	75
71	Retrieve rack id	0X0000	0X0000	0X0709	0X0000	0X00	0X00	0x00	0X00	0X0000		0 0x0015	0x44	0X0000	0X0101	0x0000	0X0000
72	Retrieve tube number.	0X0000	0X0000	0X0708	0X0000	0X00	0X00	0x00	0X00	0X0000		0 0x0013	0x44	0X0000	0X0101	0x0000	0X0000
73	Retrieve tube id (bar code)	0X0000	0X0000	0X0707	0X0000	0X00	0X00	0X00	0X00	0X0000		0 0x0016	0x44	0X0000	0X0101	0X0000	0X0000
	Get sample info from host (10 second timeout)	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X3032	0X81	0x0301	0x03	0X0000	0X001F	0X0000	92
75	Wait for sample frame capture complete.	0X0000	0X0000	0X0000	0X0000	0x00	0X00	0X00	0X00	0X3036		0 0x0000	0x00	0x0000	0x0010	0x0000	0X0000
	Make sure SPA Idle	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000	0x87	0x0011	0x44	0X0000	0x8606	0X0000	0X0000
	Send "Sample Completion" signal to host																
	Rinse and De-bubble																
77	Rotate Pipetter to tube (during de-bubble)	P3	RD	0X0000	0X0000	0x00	0x36	0X00	0X00	0X0000		0 0x0009	0x44	0X0000	0X001F	0X0000	0X0000
78	Wait for SPA and FBA Idle	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000		0 0x0011	0x44	0X0000	0x8606	0X0000	0X0000
	Start home EP / wash flow cell																
79	Start SP Home move	HC	HC	0X0000	0X0000	0x00	0x21	0X00	0X00	0X0000	0x36	0x0009	0x44	0X0000	0X0101	0X0000	0X0000
80	Time delay for 60 tubes per hr	0X0000	0X0000	0X0000	0X0000	0x00	0x00	0X00	0X00	0X0000		0 0x0000	0x82	0X0000	0x0000	0X0000	0X0000
81	Wait for SPA and FBA Idle	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000		0 0x0011	0x44	0X0000	0x0000	0x8606	32
82	Subr: Move Next	0X0000	0X0000	MN	0X0000	0X00	0X00	0X32	0X00	0X0000	0x36	0X001F	0x44	0X0000	0X0101	0x0000	0X0000
	If STM ready (next tube position or new rack) goto CheckTube	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0xFF	0X00	0X0000		0 0X0000	0X00	0X0000	0X0101	0X0008	86
84	No rack -- Last Rack	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X39	0X00	0X0000		0 0X0000	0X00	0X0000	0X0101	0X0008	99
85	Loop while waiting for STM status	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000		0 0X0000	0X00	0X0000	0X001F	0X0101	83
	Retrieve stored tube detect value; branch to "Wait for Sample..." if 0	0X0000	0X0000	0X070A	0X0000	0X00	0X00	0x00	0X00	0X0000	0x32	0x0014	0x44	0X0000	0X0101	0X0008	91
87	Retrieve rack id	0X0000	0X0000	0X0709	0X0000	0X00	0X00	0x00	0X00	0X0000		0 0x0015	0x44	0X0000	0X0101	0x0000	0X0000
88	Retrieve tube number.;	0X0000	0X0000	0X0708	0X0000	0X00	0X00	0x00	0X00	0X0000		0 0x0013	0x44	0X0000	0X0101	0x0000	0X0000
89	Retrieve tube id (bar code)	0X0000	0X0000	0X0707	0X0000	0X00	0X00	0X00	0X00	0X0000		0 0x0016	0x44	0X0000	0X0101	0X0000	0X0000
90	Get sample info from host	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X3032	0X81	0x0017	0x44	0X0000	0X001F	0X0000	0X0000
91	Done: Move Next	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0x00	0X00	0X0000		0 0x0000	0x00	0X0000	0x0000	0x0101	32

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IRIS Diagnostics
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Chatsworth,
Ca 91311
Ph# 818-709-1244

8. Schematics

Master Controller State records

State Index	State	SPAcmd	FBAcmd	STMcmd	OBAcmd	SPAcstat	FBAstat	STMstat	OBAsat	SMTest	ToSM	Tvalue	Tfunc	Sens	End	Bran	Dest
92	Subr: LIS Timeout Wait for sample frame capture complete.	0X0000	0X0000	0X0000	0X0000	0x00	0X00	0X00	0X00	0X3036	0	0x0000	0x00	0x0000	0x0010	0x0000	0X0000
93	Make sure SPA Idle Send "Sample Completion" signal to host	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000	0x87	0x0011	0x44	0X0000	0x8606	0X0000	0X0000
94	Rinse and De-bubble Rotate Pipetter to tube (during de-bubble)	P3	RD	0X0000	0X0000	0x00	0x36	0X00	0X00	0X0000	0	0x0009	0x44	0X0000	0X001F	0X0000	0X0000
95	Wait for SPA and FBA idle	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000	0	0x0011	0x44	0X0000	0x8606	0X0000	0X0000
96	Start home EP / wash flow cell Start SP Home move	HC	HC	0X0000	0X0000	0x00	0x21	0X00	0X00	0X0000	0x36	0x0009	0x44	0X0000	0X0101	0X0000	0X0000
97	Wait for sample info from host before continuing Done: LIS Timeout	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X3032	0	0x0017	0x44	0X0000	0X001F	0X0000	0X0000
98	Wait for SPA and FBA idle	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000	0	0x0011	0x44	0X0000	0x0000	0x8606	32
99	Send rack completion signal to host Set SP and CP at pinched Standby position, EndGoBranch Target; Make sure SPA and	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000	0x2F	0X0000	0X00	0X0000	0X0101	0X0000	0X0000
100	STM Idle	LO	AC	GN	0X0000	0xFF	0X21	0XFF	0X00	0X0000	0	0X001E	0x44	0X0000	0x8E0E	0X0000	0X0000
101	Branch to End of GO sequence	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000	0	0X0000	0X00	0X0000	0X0000	0X0101	103
102	Couldn't GO; flash red button for 5 seconds	0X0000	0X0000	0X0000	0X0000	0x00	0x00	0x00	0x00	0X0000	0	0x0181	0x02	0x6001	0X0000	0x0000	0X0000
103	End of GO RESUME "16" sequence	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000	0	0X0000	0X00	0X0000	0X001F	0X0000	0X0000
104	Begin of "0e" (Clear Racks); full stop	RE	RE	RE	0X0000	0xFF	0XFF	0XFF	0X00	0X0000	0x2F	0X0020	0x44	0X0000	0X8E0E	0X0000	0X0000
105	Start 3 Funcs: PH, CR, HS	PH	AC	CR	0x0000	0x00	0X21	0X00	0x00	0X0000	0	0x0009	0x44	0X0000	0X005F	0X0000	0X0000
106	Wait for SPA, FBA, and STM idle	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0xFF	0X00	0X0000	0	0x0011	0x44	0X0000	0x8E0E	0X0000	0X0000
107	Turn off waste pump	LO	0X0000	0X0000	0X0000	0x35	0x00	0X00	0X00	0X0000	0	0x0009	0x44	0X0000	0X001F	0X0000	0X0000
108	Turn off waste pump	0X0000	0X0000	0X0000	0X0000	0xFF	0x00	0X00	0X00	0X0000	0	0x0011	0x44	0X0000	0X001F	0X0000	0X0000
109	End of "0e" (Clear Racks)	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000	0	0X0000	0X00	0X0000	0X001F	0X0000	0X0000
110	Begin of "RQ" (Run QC Control)	RE	RE	RE	0X0000	0xFF	0XFF	0XFF	0X00	0X0000	0	0X0023	0x44	0X0000	0X8E0E	0X0000	0X0000
111	Retrieve tube number, branch to Wash ("WA"), if 1 (0x01), term otherwise	0X0000	0X0000	0X0708	0X0000	0X00	0X00	0x01	0X00	0X0000	0	0X0024	0x44	0X0000	0X0101	0X0008	0x5741
112	Retrieve tube number, branch to Diluent ("DL") if 2 (0x02), term otherwise	0X0000	0X0000	0X0708	0X0000	0X00	0X00	0x02	0X00	0X0000	0	0X0025	0x44	0X0000	0X0101	0X0008	0x444C
113	Retrieve tube number, branch to Diluent ("DL") if 3 (0x03), term otherwise	0X0000	0X0000	0X0708	0X0000	0X00	0X00	0x03	0X00	0X0000	0	0X0026	0x44	0X0000	0X0101	0X0008	0x444C
114	Retrieve tube number, branch to Clear rack ("0e") if 4 (0x04), term otherwise	0X0000	0X0000	0X0708	0X0000	0X00	0X00	0x04	0X00	0X0000	0	0X0026	0x44	0X0000	0X0101	0X0008	0x3045
115	Retrieve tube number, branch to AutoFocus ("17") if 5 (0x05), term otherwise	0X0000	0X0000	0X0708	0X0000	0X00	0X00	0x05	0X00	0X0000	0	0X0027	0x44	0X0000	0X0101	0X0008	0x3137
116	Retrieve tube number, branch to Diluent ("DL") if 10 (0x0A), term otherwise	0X0000	0X0000	0X0708	0X0000	0X00	0X00	0x0A	0X00	0X0000	0	0X0028	0x44	0X0000	0X0101	0X0008	0x444C
117	Retrieve tube id (bar code)	0X0000	0X0000	0X0707	0X0000	0X00	0X00	0X00	0X00	0X0000	0	0X0029	0x44	0X0000	0X0101	0X0000	0X0000
118	Get sample info from host	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X3032	0x81	0X002A	0x44	0X0000	0X001F	0X0000	0X0000
119	If SM replies "00", branch to "Move to Next control tube position"	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X3030	0xF2	0X0000	0X00	0X0000	0X0101	0X0020	144

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8. Schematics

Master Controller State records

State Index	State	SPAcmd	FBAcmd	STMcmd	OBAcmd	SPAstat	FBAstat	STMstat	OBAsat	SMTTest	ToSM	Tvalue	Tfunc	Sens	End	Bran	Dest
120	If SM replies '-2-', branch to "0e" (Clear Rack)	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X2D32	0xF2	0X0000	0X00	0X0000	0X0101	0X0020	0x3045
121	Pipette down to test tube, Clean flow cell (initialize EP pump), Place SP on tube	P1	SH	0X0000	0X0000	0x11	0x00	0X00	0X00	0X0000		0 0x0009	0x44	0X0000	0X001F	0X0000	0X0000
122	Wait for SPA and FBA idle	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000		0 0x0011	0x44	0X0000	0x8606	0X0000	0X0000
123	Wait for "image processing idle"	0X0000	0X0000	0X0000	0X0000	0x00	0x00	0X00	0X00	0x3338	0x37	0X0000	0x00	0X0000	0X001F	0X0000	0X0000
124	Start Lamina for background capture	SB	0X0000	0X0000	0X0000	0x31	0X00	0X00	0X00	0X0000		0 0x0009	0x44	0X0000	0x001F	0X0000	0X0000
	Capture background and wait for frame processing complete (future wait for frame capture complete).																
125		0X0000	0X0000	0X0000	0X0000	0x00	0x00	0x00	0x00	0X3034	0XB3	0x0009	0x44	0x0000	0x0010	0x0000	0X0000
126	Wait for SB complete	0X0000	0X0000	0X0000	0X0000	0xFF	0x00	0X00	0X00	0X0000		0 0x0011	0x44	0X0000	0X001F	0X0000	0X0000
127	Turn off EP pump on SPA	EB	0X0000	0X0000	0X0000	0x34	0x00	0X00	0X00	0X0000		0 0x0009	0x44	0X0000	0x001F	0X0000	0X0000
128	Wait for EB complete	0X0000	0X0000	0X0000	0X0000	0xFF	0x00	0X00	0X00	0X0000		0 0x0011	0x44	0X0000	0X001F	0X0000	0X0000
129	Wait for "image processing idle"	0X0000	0X0000	0X0000	0X0000	0x00	0x00	0X00	0X00	0x3338	0x37	0X0000	0x00	0X0000	0X001F	0X0000	0X0000
130	Start aspiration for sample transfer	AS	RC	0X0000	0X0000	0x17	0x00	0X00	0X00	0X0000		0 0x0009	0x44	0X0000	0X001F	0X0000	0X0000
131	Wait for AS and RC complete	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000		0 0x0011	0x44	0X0000	0x8606	0X0000	0X0000
132	Test Lamina Full Sensor	0X0000	0X0000	0X0000	0X0000	0X00	0x00	0X00	0X00	0X0000		0 0X0000	0X00	0x0033	0x0101	0x0001	#####
	Timer delay before capture																
133	To waste well (with Lamina fill)	P4	0X0000	MN	0X0000	0x15	0x00	0x00	0x00	0X0000		0 0X0062	0x43	0X0000	0X0000	0x0000	135
	Timer delay before capture																
134	To waste well (no Lamina fill)	P2	0X0000	MN	0X0000	0x15	0x00	0x00	0x00	0X0000		0 0X0062	0x42	0X0000	0X0000	0x0000	0X0000
	Move to next tube																
	Capture sample frames and wait for sample frame capture complete or short sample detector.																
135		0X0000	0X0000	0X0000	0X0000	0x00	0X00	0X00	0X00	0X3036	0XB5	0x0000	0x00	0x0000	0x0010	0x0000	0X0000
136	Turn off EP pump on SPA, SP pump on FBA	EB	EB	0X0000	0X0000	0x34	0x00	0X00	0X00	0X0000		0 0x0009	0x44	0X0000	0X001F	0X0000	0X0000
137	Wait for EB's complete (SPA and FBA)	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000		0 0x0011	0x44	0X0000	0X8606	0X0000	0X0000
	Rinse and De-bubble																
138	Rotate Pipetter to tube (during de-bubble)	P3	RD	0X0000	0X0000	0x00	0x36	0X00	0X00	0X0000		0 0X0000	0X00	0X0000	0X001F	0X0000	0X0000
139	Wait for SPA and FBA idle	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000		0 0x0011	0x44	0X0000	0x8606	0X0000	0X0000
	Start home EP / wash flow cell																
140	Start SP Home move	HC	HC	0X0000	0X0000	0x00	0x21	0X00	0X00	0X0000	0x36	0x0009	0x44	0X0000	0X0101	0X0000	0X0000
141	Wait for SPA and FBA idle	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000		0 0x0011	0x44	0X0000	0x8606	0X0000	0X0000
	Send completion signal to host																
	Wait for control result from host; branch to "0e" (Clear Rack) if failed (0).																
142		0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0x3245	0x87	0X002C	0x44	0X0000	0x001F	0X0000	0X0000
143	If SM replies '0', branch to "0e" (Clear Rack)	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0x3030	0xFE	0X0000	0X00	0X0000	0X0101	0X0020	0x3045
144	Branch to "16" (Go Resume)	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000		0 0X0000	0X00	0X0000	0X0101	0x3136	0x3136
145	End of RQ sequence	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000		0 0X0000	0X00	0X0000	0X001F	0X0000	0X0000
146	Begin "17" (AutoFocus control); Reset HLCs	RE	RE	RE	0X0000	0XFF	0XFF	0XFF	0X00	0X0000		0 0X002E	0x44	0X0000	0X001F	0X0000	0X0000
147	Retrieve control id (bar code)	0X0000	0X0000	0X0707	0X0000	0X00	0X00	0X00	0X00	0X0000		0 0X002F	0x44	0X0000	0X0101	0X0000	0X0000
148	Get sample info from host	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X3032	0x81	0X0030	0x44	0X0000	0X001F	0X0000	0X0000
149	If SM replies '00', branch to "Move to Next control tube position (AF)"	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X3030	0xF2	0X0000	0X00	0X0000	0X0101	0X0020	330

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8. Schematics

Master Controller State records

State Index	State	SPAcmd	FBAcmd	STMcmd	OBAcmd	SPAstat	FBAstat	STMstat	OBAstat	SMTest	ToSM	Tvalue	Tfunc	Sens	End	Bran	Dest
150	If SM replies '-2', branch to "0e" (Clear Rack)	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X2D32	0xF2	0X0000	0X00	0X0000	0X0101	0X0020	0x3045
151	Record current autofocus position (requires going home)	0X0000	0X0000	0X0000	HW	0X00	0X00	0X00	0x31	0X0000		0 0x2000	0x04	0X0000	0x0040	0X0000	0X0000
152	Wait for OBA complete.	0X0000	0X0000	0X0000	0x0000	0X00	0X00	0X00	0xFF	0X0000		0 0x2000	0x04	0X0000	0x0040	0X0000	0X0000
153	Return to autofocus position	0X0000	0X0000	0X0000	MO	0X00	0X00	0X00	0x32	0X0000		0 0x2000	0x04	0X0000	0x0040	0X0000	0X0000
154	Wait for OBA complete.	0X0000	0X0000	0X0000	0x0000	0X00	0X00	0X00	0xFF	0X0000		0 0x2000	0x04	0X0000	0x0040	0X0000	0X0000
	AutoFocusReadyForCommand: Tell host we're ready for a command																
155	Wait for an auto focus command	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0x3133	0x14	0x2000	0x04	0X0000	0X001F	0x0000	0x0000
156	SM reply = "00" --> Auto focus move next	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0x3030	0xF3	0X0000	0X00	0X0000	0X0101	0x2020	329
	SM reply = "01" -->																
157	AutoFocusLightLevelAdjustment	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0x3031	0xF3	0X0000	0X00	0X0000	0X0101	0x2020	178
158	SM reply = "02" --> AutoFocusCoarse	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0x3032	0xF3	0X0000	0X00	0X0000	0X0101	0x2020	186
159	SM reply = "03" --> AutoFocusPeak	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0x3033	0xF3	0X0000	0X00	0X0000	0X0101	0x2020	221
160	SM reply = "04" --> AutoFocusClinical	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0x3034	0xF3	0X0000	0X00	0X0000	0X0101	0x2020	259
161	SM reply = "05" --> AutoFocusClinical	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0x3035	0xF3	0X0000	0X00	0X0000	0X0101	0x2020	331
	SM reply = "10" -->																
162	AutoFocusCoarseFinalOffset	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0x3130	0xF3	0X0000	0X00	0X0000	0X0101	0x2020	299
	SM reply = "11" -->																
163	AutoFocusPeakFinalOffset	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0x3131	0xF3	0X0000	0X00	0X0000	0X0101	0x2020	301
	SM reply = "12" -->																
164	AutoFocusClinicalFinalOffset	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0x3132	0xF3	0X0000	0X00	0X0000	0X0101	0x2020	303
165	SM reply = "20" --> AutoFocusForward1	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0x3230	0xF3	0X0000	0X00	0X0000	0X0101	0x2020	305
166	SM reply = "21" --> AutoFocusForward2	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0x3231	0xF3	0X0000	0X00	0X0000	0X0101	0x2020	307
167	SM reply = "22" --> AutoFocusForward4	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0x3232	0xF3	0X0000	0X00	0X0000	0X0101	0x2020	309
168	SM reply = "23" --> AutoFocusForward8	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0x3233	0xF3	0X0000	0X00	0X0000	0X0101	0x2020	311
169	SM reply = "24" --> AutoFocusForward16	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0x3234	0xF3	0X0000	0X00	0X0000	0X0101	0x2020	313
170	SM reply = "25" --> AutoFocusForward32	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0x3235	0xF3	0X0000	0X00	0X0000	0X0101	0x2020	315
171	SM reply = "26" --> AutoFocusForward64	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0x3236	0xF3	0X0000	0X00	0X0000	0X0101	0x2020	317
172	AutoFocusForward128	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0x3237	0xF3	0X0000	0X00	0X0000	0X0101	0x2020	319
	SM reply = "27" -->																
	SM reply = "28" -->																
173	AutoFocusForward256	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0x3238	0xF3	0X0000	0X00	0X0000	0X0101	0x2020	321
	SM reply = "29" -->																
174	AutoFocusForward512	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0x3239	0xF3	0X0000	0X00	0X0000	0X0101	0x2020	323
	SM reply = "2A" -->																
175	AutoFocusForward1024	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0x3241	0xF3	0X0000	0X00	0X0000	0X0101	0x2020	325
176	SM reply = "2B" -->																
	AutoFocusForward2048	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0x3242	0xF3	0X0000	0X00	0X0000	0X0101	0x2020	327

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IRIS Diagnostics
9172 Eton Ave
Chatsworth,
Ca 91311
Ph# 818-709-1244

8. Schematics

Master Controller State records

State Index	State	SPACmd	FBAcmd	STMcmd	OBAcmd	SPAstat	FBAstat	STMstat	OBAstat	SMTTest	ToSM	Tvalue	Tfunc	Sens	End	Bran	Dest
177	Branch to AutoFocusReadyForCommand AutoFocus.LightLevelAdjustment: Send current strobe setting to host	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000	0	0X0000	0X00	0X0000	0X0000	0X0101	155
178	Wait for strobe setting	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0x3130	0x8B	0x2000	0x04	0X0000	0X001F	0x0000	0x0000
179	Pause for it to take effect	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0x0000	0	0X0032	0x42	0X0000	0X001F	0x0000	0x0000
180	Send strobe setting to SM	0X0000	0X0000	0X0000	0X0000	0x00	0x00	0X00	0X00	0X0000	0x8B	0X0000	0x00	0X0000	0x0101	0X0000	0X0000
181	Wait for "image processing idle"	0X0000	0X0000	0X0000	0X0000	0x00	0x00	0X00	0X00	0x3338	0x37	0X0000	0x00	0X0000	0X001F	0X0000	0X0000
	Capture backgrounds for light level Wait for SM to be done with light level backgrounds																
182		0X0000	0X0000	0X0000	0X0000	0x00	0x00	0x00	0x00	0x3034	0x83	0x0000	0x00	0x0000	0x001F	0x0000	0x0000
183	If SM replies '00' branch to "Handle strobe"; else fall through	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X3030	0xF4	0X0000	0X00	0X0000	0X0101	0X0020	296
184	Send completion signal to host	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0x0000	0x87	0X0000	0X00	0X0000	0X0101	0X0000	0X0000
185	Branch to AutoFocusReadyForCommand	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000	0	0X0000	0X00	0X0000	0X0000	0X0101	155
186	AutoFocusCoarse: Retrieve control id (bar code)	0X0000	0X0000	0X0707	0X0000	0X00	0X00	0X00	0X00	0X0000	0	0X002F	0x44	0X0000	0X0101	0X0000	0X0000
187	Get sample info from host	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X3032	0x81	0X0030	0x44	0X0000	0X001F	0X0000	0X0000
188	If SM replies '00', branch to "Move to Next control tube position (AF)"	0X0000	0X0000		0X0000	0X00	0X00	0X00	0X00	0X3030	0xF2	0X0000	0X00	0X0000	0X0101	0X0020	330
189	If SM replies '2', branch to "0e" (Clear Rack)	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X2D32	0xF2	0X0000	0X00	0X0000	0X0101	0X0020	0x3045
190	To test tube (initialize EP pump)	P1	SH	0X0000	0X0000	0x11	0x00	0X00	0X00	0X0000	0	0x0009	0x44	0X0000	0X001F	0X0000	0X0000
191	Wait for P1 complete	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000	0	0x0011	0x44	0X0000	0X8606	0X0000	0X0000
192	Wait for "image processing idle"	0X0000	0X0000	0X0000	0X0000	0x00	0x00	0X00	0X00	0x3338	0x37	0X0000	0x00	0X0000	0X001F	0X0000	0X0000
193	Start Lamina for background capture	SB	0X0000	0X0000	0X0000	0x31	0X00	0X00	0X00	0X0000	0	0x0009	0x44	0X0000	0x001F	0X0000	0X0000
194	Wait for SB complete	0X0000	0X0000	0X0000	0X0000	0xFF	0x00	0X00	0X00	0X0000	0	0x0011	0x44	0X0000	0X001F	0X0000	0X0000
195	Timer delay before capture	0X0000	0X0000	0X0000	0X0000	0x00	0x00	0x00	0x00	0X0000	0	0X0018	0x42	0X0000	0X0000	0x0000	0X0000
	Capture background and wait for frame processing complete (future wait for frame capture complete).																
196		0X0000	0X0000	0X0000	0X0000	0x00	0x00	0x00	0x00	0X3034	0X83	0x0000	0x00	0x0000	0x0010	0x0000	0X0000
197	Turn off EP pump on SPA	EB	0X0000	0X0000	0X0000	0x34	0x00	0X00	0X00	0X0000	0	0x0009	0x44	0X0000	0x001F	0X0000	0X0000
198	Wait for EB complete	0X0000	0X0000	0X0000	0X0000	0xFF	0x00	0X00	0X00	0X0000	0	0x0011	0x44	0X0000	0X001F	0X0000	0X0000
199	Initial offset A (coarse)	0X0000	0X0000	0X0000	IA	0X00	0X00	0X00	0x33	0X0000	0	0X003B	0x44	0X0000	0x0040	0X0000	0X0000
200	Wait for OBA back to idle	0X0000	0X0000	0X0000	0x0000	0X00	0X00	0X00	0xFF	0X0000	0	0X003B	0x44	0X0000	0x0040	0X0000	0X0000
201	Wait for "image processing idle"	0X0000	0X0000	0X0000	0X0000	0x00	0x00	0X00	0X00	0x3338	0x37	0X0000	0x00	0X0000	0X001F	0X0000	0X0000
202	Start aspiration for sample transfer	AF	RF	0X0000	0X0000	0x28	0x00	0X00	0X00	0X0000	0	0x0009	0x44	0X0000	0X001F	0X0000	0X0000
203	Wait for AS and RC complete	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000	0	0x0011	0x44	0X0000	0x8606	0X0000	0X0000
204	Test Lamina Full Sensor	0X0000	0X0000	0X0000	0X0000	0X00	0x00	0X00	0X00	0X0000	0	0X0000	0X00	0x0033	0x0101	0x0001	#####
	Timer delay before capture To waste well (with Lamina fill) Move to next tube																
205		P4	0X0000	0X0000	0X0000	0x15	0x00	0x00	0x00	0X0000	0	0X0062	0x43	0X0000	0X0000	0x0000	207
	Timer delay before capture To waste well (no Lamina fill) Move to next tube																
206		P2	0X0000	0X0000	0X0000	0x15	0x00	0x00	0x00	0X0000	0	0X0062	0x42	0X0000	0X0000	0x0000	0X0000
207	Timer delay before capture	0X0000	0X0000	0X0000	0X0000	0x00	0x00	0x00	0x00	0X0000	0	0X0062	0x42	0X0000	0X0000	0x0000	0X0000
208	CoarseFW1_AF	0X0000	0X0000	0X0000	NA	0X00	0x28	0X00	0x33	0X0000	0	0X0041	0x44	0X0000	0x0040	0X0000	0X0000

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Master Controller State records

State Index	State	SPAcmd	FBAcmd	STMcmd	OBAcmd	SPAstat	FBAstat	STMstat	OBAstat	SMTest	ToSM	Tvalue	Tfunc	Sens	End	Bran	Dest
209	Wait for OBA back to idle	0X0000	0X0000	0X0000	0x0000	0X00	0X00	0X00	0xFF	0X0000		0 0x2000	0x04	0X0000	0x0040	0X0000	0X0000
210	Capture sample frames ("SMCSAtNextAutoFocusPosition") and wait for sample frame capture complete.	0X0000	0X0000	0X0000	0X0000	0x00	0X00	0X00	0X00	0X3036	0X8D	0x0000	0x00	0X0000	0x0010	0x0000	0x0000
211	If SM argument to "DoneGatheringImages" is '00' branch to Forward1OnFocusMotor; else fall through	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X3030	0xF6	0X0000	0X00	0X0000	0X0101	0X0020	208
212	Wait for SPA and FBA idle	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000		0 0x0011	0x44	0X0000	0X8606	0X0000	0X0000
213	Turn off EP pump on SPA, SP pump on FBA	EB	0X0000	0X0000	0X0000	0x34	0x00	0X00	0X00	0X0000		0 0x0009	0x44	0X0000	0X001F	0X0000	0X0000
214	Wait for EB's complete (SPA and FBA)	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000		0 0x0011	0x44	0X0000	0X8606	0X0000	0X0000
215	To Waste Well	P3	0X0000	0X0000	0X0000	0x00	0x36	0X00	0X00	0X0000		0 0x0009	0x44	0X0000	0X001F	0X0000	0X0000
216	Wait for SPA and FBA idle	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000		0 0x0011	0x44	0X0000	0X8606	0X0000	0X0000
217	Clear Pipetter/Home CP and SP	HC	0x0000	0X0000	0X0000	0x00	0x21	0X00	0X00	0X0000		0 0x0009	0x44	0X0000	0X0101	0X0000	0X0000
218	Wait for HC's complete (SPA and FBA)	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000		0 0x0011	0x44	0X0000	0X8606	0X0000	0X0000
219	Send completion signal to host	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0x0000	0X87	0X0000	0X00	0X0000	0x0101	0x0000	0x0000
220	Branch to AutoFocusReadyForCommand	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000		0 0X0000	0X00	0X0000	0X0000	0X0101	155
221	AutoFocusPeak: Retrieve control id (bar code)	0X0000	0X0000	0X0707	0X0000	0X00	0X00	0X00	0X00	0X0000		0 0X002F	0x44	0X0000	0X0101	0X0000	0X0000
222	Get sample info from host	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X3032	0x81	0X0030	0x44	0X0000	0X001F	0X0000	0X0000
223	If SM replies '00', branch to "Move to Next control tube position (AF)"	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X3030	0xF2	0X0000	0X00	0X0000	0X0101	0X0020	0x3136
224	If SM replies '-2', branch to "0e" (Clear Rack)	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X2D32	0xF2	0X0000	0X00	0X0000	0X0101	0X0020	0x3045
225	To test tube (initialize EP pump)	P1	0X0000	0X0000	0X0000	0x11	0x00	0X00	0X00	0X0000		0 0x0009	0x44	0X0000	0X001F	0X0000	0X0000
226	Wait for SPA and FBA idle	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000		0 0x0011	0x44	0X0000	0X8606	0X0000	0X0000
227	Wait for "image processing idle"	0X0000	0X0000	0X0000	0X0000	0x00	0x00	0X00	0X00	0x3338	0x37	0X0000	0x00	0X0000	0X001F	0X0000	0X0000
228	Start Lamina for background capture	SB	0X0000	0X0000	0X0000	0x31	0X00	0X00	0X00	0X0000		0 0x0009	0x44	0X0000	0x001F	0X0000	0X0000
229	Wait for SB complete	0X0000	0X0000	0X0000	0X0000	0xFF	0x00	0X00	0X00	0X0000		0 0x0011	0x44	0X0000	0X001F	0X0000	0X0000
230	Timer delay before capture	0X0000	0X0000	0X0000	0X0000	0x00	0x00	0x00	0x00	0X0000		0 0X0018	0x42	0X0000	0X0000	0x0000	0X0000
231	Capture background and wait for frame processing complete (future wait for frame capture complete).	0X0000	0X0000	0X0000	0X0000	0x00	0x00	0x00	0x00	0X3034	0X83	0x0000	0x00	0X0000	0x0010	0x0000	0X0000
232	Turn off EP pump on SPA	EB	0X0000	0X0000	0X0000	0x34	0x00	0X00	0X00	0X0000		0 0x0009	0x44	0X0000	0x001F	0X0000	0X0000
233	Wait for EB complete	0X0000	0X0000	0X0000	0X0000	0xFF	0x00	0X00	0X00	0X0000		0 0x0011	0x44	0X0000	0X001F	0X0000	0X0000
234	If SM replies '-1' branch to "End"; else fall through	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0x2D31	0xF4	0X0000	0X00	0X0000	0X0101	0X0020	338
235	Initial offset B (peak)	0X0000	0X0000	0X0000	IB	0X00	0X00	0X00	0x33	0X0000		0 0X003B	0x44	0X0000	0x0040	0X0000	0X0000
236	Wait for OBA back to idle	0X0000	0X0000	0X0000	0x0000	0X00	0X00	0X00	0xFF	0X0000		0 0X003B	0x44	0X0000	0x0040	0X0000	0X0000
237	Wait for "image processing idle"	0X0000	0X0000	0X0000	0X0000	0x00	0x00	0X00	0X00	0x3338	0x37	0X0000	0x00	0X0000	0X001F	0X0000	0X0000
238	Start aspiration for sample transfer	AF	RF	0X0000	0X0000	0x28	0x00	0X00	0X00	0X0000		0 0x0009	0x44	0X0000	0X001F	0X0000	0X0000
239	Wait for AS and RC complete	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000		0 0x0011	0x44	0X0000	0x8606	0X0000	0X0000
240	Test Lamina Full Sensor	0X0000	0X0000	0X0000	0X0000	0X00	0x00	0X00	0X00	0X0000		0 0X0000	0X00	0x0033	0x0101	0x0001	#####

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Master Controller State records

State Index	State	SPAcmd	FBAcmd	STMcmd	OBACmd	SPAstat	FBAstat	STMstat	OBAstat	SMTTest	ToSM	Tvalue	Tfunc	Sens	End	Bran	Dest
241	Timer delay before capture To waste well (with Lamina fill) Move to next tube	P4	0X0000	0X0000	0X0000	0x15	0x00	0x00	0x00	0X0000	0	0X0062	0x43	0X0000	0X0000	0x0000	243
242	Timer delay before capture To waste well (no Lamina fill) Move to next tube	P2	0X0000	0X0000	0X0000	0x15	0x00	0x00	0x00	0X0000	0	0X0062	0x42	0X0000	0X0000	0x0000	0X0000
243	Timer delay before capture	0X0000	0X0000	0X0000	0X0000	0x00	0x00	0x00	0x00	0X0000	0	0X0062	0x42	0X0000	0X0000	0x0000	0X0000
244	PeakFW1_AF	0X0000	0X0000	0X0000	NB	0X00	0x28	0X00	0x33	0X0000	0	0X0041	0x44	0X0000	0x0040	0X0000	0X0000
245	Wait for OBA back to idle	0X0000	0X0000	0X0000	0x0000	0X00	0X00	0X00	0xFF	0X0000	0	0X003B	0x44	0X0000	0x0040	0X0000	0X0000
	Capture sample frames ("SMCSAtNextAutoFocusPosition") and wait for sample frame capture complete.	0X0000	0X0000	0X0000	0X0000	0x00	0X00	0X00	0X00	0X3036	0x8D	0x0000	0x00	0x0000	0x0010	0x0000	0X0000
247	If SM argument to "DoneGatheringImages" is '00' branch to Forward1OnFocusMotor; else fall through	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X3030	0xF6	0X0000	0X00	0X0000	0X0101	0X0020	244
248	Wait for SPA and FBA idle	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000	0	0x0011	0x44	0X0000	0X8606	0X0000	0X0000
249	Turn off EP pump on SPA, SP pump on FBA	EB	0X0000	0X0000	0X0000	0x34	0x00	0X00	0X00	0X0000	0	0x0009	0x44	0X0000	0X001F	0X0000	0X0000
250	Wait for EB's complete (SPA and FBA)	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000	0	0x0011	0x44	0X0000	0X8606	0X0000	0X0000
251	To Waste Well	P3	RD	0X0000	0X0000	0x00	0x36	0X00	0X00	0X0000	0	0x0009	0x44	0X0000	0X001F	0X0000	0X0000
252		0X0000	0X0000	0X0000	0X0000	0xFF	0x00	0X00	0X00	0X0000	0	0x0011	0x44	0X0000	0X001F	0X0000	0X0000
253		0X0000	0X0000	0X0000	0X0000	0x00	0xFF	0X00	0X00	0X0000	0	0x0011	0x44	0X0000	0X001F	0X0000	0X0000
254	Clear Pipetter/Home CP and SP	HC	0X0000	0x0000	0X0000	0x00	0x21	0X00	0X00	0X0000	0	0x0009	0x44	0X0000	0x0101	0X0000	0X0000
255	Wait for SPA and FBA idle	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000	0	0x0011	0x44	0X0000	0X8606	0X0000	0X0000
256	Send completion signal to host	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0x0000	0x87	0X0000	0X00	0X0000	0x0101	0x0000	0x0000
257	Wait for AF and RF complete	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000	0	0x0011	0x44	0X0000	0x8606	0X0000	0X0000
258	Branch to AutoFocusReadyForCommand	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000	0	0X0000	0X00	0X0000	0X0000	0X0101	155
259	AutoFocusClinical: Retrieve control id (bar code)	0X0000	0X0000	0X0707	0X0000	0X00	0X00	0X00	0X00	0X0000	0	0X002F	0x44	0X0000	0X0101	0X0000	0X0000
260	Get sample info from host	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X3032	0x81	0X0030	0x44	0X0000	0X001F	0X0000	0X0000
261	If SM replies '00', branch to "Move to Next control tube position (AF)"	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X3030	0xF2	0X0000	0X00	0X0000	0X0101	0X0020	0x3136
262	If SM replies "2", branch to "0e" (Clear Rack)	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X2D32	0xF2	0X0000	0X00	0X0000	0X0101	0X0020	0x3045
263	To test tube (initialize EP pump)	P1	SH	0X0000	0X0000	0x11	0x00	0X00	0X00	0X0000	0	0x0009	0x44	0X0000	0X001F	0X0000	0X0000
264	Wait for SPA and FBA idle	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000	0	0x0011	0x44	0X0000	0X8606	0X0000	0X0000
265	Wait for "image processing idle"	0X0000	0X0000	0X0000	0X0000	0x00	0x00	0X00	0X00	0x3338	0x37	0X0000	0x00	0X0000	0X001F	0X0000	0X0000
266	Start Lamina for background capture	SB	0X0000	0X0000	0X0000	0x31	0X00	0X00	0X00	0X0000	0	0x0009	0x44	0X0000	0x001F	0X0000	0X0000
267	Wait for SB complete	0X0000	0X0000	0X0000	0X0000	0xFF	0x00	0X00	0X00	0X0000	0	0x0011	0x44	0X0000	0X001F	0X0000	0X0000
268	Timer delay before capture	0X0000	0X0000	0X0000	0X0000	0x00	0x00	0x00	0x00	0X0000	0	0X0018	0x42	0X0000	0X0000	0x0000	0X0000
	Capture background and wait for frame processing complete (future wait for frame capture complete).																
269		0X0000	0X0000	0X0000	0X0000	0x00	0x00	0x00	0x00	0X3034	0x83	0x0000	0x00	0X0000	0x0010	0x0000	0x0000
270	Turn off EP pump on SPA	EB	0X0000	0X0000	0X0000	0x34	0x00	0X00	0X00	0X0000	0	0x0009	0x44	0X0000	0x001F	0X0000	0X0000
271	Wait for EB complete	0X0000	0X0000	0X0000	0X0000	0xFF	0x00	0X00	0X00	0X0000	0	0x0011	0x44	0X0000	0X001F	0X0000	0X0000

Diagram drawings may change without notice. Please contact IRIS Diagnostics to determine the current revision level.

IRIS Diagnostics
9172 Eton Ave
Chatsworth,
Ca 91311
Ph# 818-709-1244

8. Schematics

Master Controller State records

State Index	State	SPAcmd	FBAcmd	STMcmd	OBACmd	SPAStat	FBAstat	STMstat	OBAStat	SMTest	ToSM	Tvalue	Tfunc	Sens	End	Bran	Dest
272	If SM replies '-1' branch to "End"; else fall through	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0x2D31	0xF4	0X0000	0X00	0X0000	0X0101	0X0020	338
273	Initial offset C (clinical)	0X0000	0X0000	0X0000	IC	0X00	0X00	0X00	0x33	0X0000		0 0X003B	0x44	0X0000	0x0040	0X0000	0X0000
274	Wait for OBA back to idle	0X0000	0X0000	0X0000	0x0000	0X00	0X00	0X00	0xFF	0X0000		0 0X003B	0x44	0X0000	0x0040	0X0000	0X0000
275	Wait for "image processing idle"	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0x3338	0x37	0X0000	0x00	0X0000	0X001F	0X0000	0X0000
276	Start aspiration for sample transfer	AF	RF	0X0000	0X0000	0x28	0x00	0X00	0X00	0X0000		0 0x0009	0x44	0X0000	0X001F	0X0000	0X0000
277	Wait for AS and RC complete	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000		0 0x0011	0x44	0X0000	0x8606	0X0000	0X0000
278	Test Lamina Full Sensor	0X0000	0X0000	0X0000	0X0000	0X00	0x00	0X00	0X00	0X0000		0 0X0000	0X00	0x0033	0x0101	0x0001	#####
	Timer delay before capture																
	To waste well (with Lamina fill)																
279	Move to next tube	P4	0X0000	0X0000	0X0000	0x15	0x00	0x00	0x00	0X0000	0 0X0062	0x43	0x00	0X0000	0X0000	0x0000	281
	Timer delay before capture																
	To waste well (no Lamina fill)																
280	Move to next tube	P2	0X0000	0X0000	0X0000	0x15	0x00	0x00	0x00	0X0000	0 0X0062	0x42	0x00	0X0000	0X0000	0x0000	0X0000
281	Timer delay before capture	0X0000	0X0000	0X0000	0X0000	0x00	0x00	0x00	0x00	0X0000		0 0X0062	0x42	0X0000	0X0000	0x0000	0X0000
282	ClinicalFW1_AF	0X0000	0X0000	0X0000	NC	0X00	0x28	0X00	0x33	0X0000		0 0X0041	0x44	0X0000	0x0040	0X0000	0X0000
283	Wait for OBA back to idle	0X0000	0X0000	0X0000	0x0000	0X00	0X00	0X00	0xFF	0X0000		0 0X003B	0x44	0X0000	0x0040	0X0000	0X0000
	Capture sample frames ("SMCSATNextAutoFocusPosition") and wait for sample frame capture complete.	0X0000	0X0000	0X0000	0X0000	0x00	0X00	0X00	0X00	0X3036	0X8D	0x0000	0x00	0x0000	0x0010	0x0000	0X0000
284																	
	If SM argument to "DoneGatheringImages" is '00' branch to Forward1OnFocusMotor; else fall through	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X3030	0xF6	0X0000	0X00	0X0000	0X0101	0X0020	282
285	Wait for SPA and FBA idle	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000		0 0x0011	0x44	0X0000	0X8606	0X0000	0X0000
	Turn off EP pump on SPA, SP pump on FBA	EB	EB	0X0000	0X0000	0x34	0x00	0X00	0X00	0X0000		0 0x0009	0x44	0X0000	0X001F	0X0000	0X0000
288	Wait for EB's complete (SPA and FBA)	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000		0 0x0011	0x44	0X0000	0X8606	0X0000	0X0000
289	To Waste Well	P3	RD	0X0000	0X0000	0x00	0x36	0X00	0X00	0X0000		0 0x0009	0x44	0X0000	0X001F	0X0000	0X0000
290	Wait for SPA and FBA idle	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000		0 0x0011	0x44	0X0000	0X8606	0X0000	0X0000
291	Clear Pipetter/Home CP and SP	HC	HC	0x0000	0X0000	0x00	0x21	0X00	0X00	0X0000		0 0x0009	0x44	0X0000	0X0101	0X0000	0X0000
292	Wait for SPA and FBA idle	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000		0 0x0011	0x44	0X0000	0X8606	0X0000	0X0000
293	Send completion signal to host	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0x0000	0X87	0X0000	0X00	0X0000	0x0101	0x0000	0x0000
294	Wait for AF and RF complete	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000		0 0x0011	0x44	0X0000	0x8606	0X0000	0X0000
295	Branch to AutoFocusReadyForCommand	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000		0 0X0000	0X00	0X0000	0X0000	0X0101	155
296	HandleStrobe: wait for strobe setting	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0x3130		0 0X0044	0x44	0X0000	0X001F	0x0000	0x0000
297	Pause for it to take effect	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0x0000		0 0X0045	0x42	0X0000	0X001F	0x0000	0x0000
298	Send strobe setting to SM	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0x3034	0x8B	0X0000	0X00	0X0000	0x0000	0x001F	183
299	AutoFocusCoarseFinalOffset	0X0000	0X0000	0X0000	BA	0X00	0X00	0X00	0x33	0X0000		0 0x2000	0x04	0X0000	0x0040	0X0000	0X0000
	Wait for OBA and Branch to																
300	AutoFocusReadyForCommand	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0xFF	0X0000		0 0x0011	0x44	0X0000	0x0040	0x0040	155
301	AutoFocusPeakFinalOffset	0X0000	0X0000	0X0000	BB	0X00	0X00	0X00	0x33	0X0000		0 0x2000	0x04	0X0000	0x0040	0X0000	0X0000
	Wait for OBA and Branch to																
302	AutoFocusReadyForCommand	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0xFF	0X0000		0 0x0011	0x44	0X0000	0x0040	0x0040	155
303	AutoFocusClinicalFinalOffset	0X0000	0X0000	0X0000	BC	0X00	0X00	0X00	0x33	0X0000		0 0x2000	0x04	0X0000	0x0040	0X0000	0X0000

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IRIS Diagnostics
9172 Eton Ave
Chatsworth,
Ca 91311
Ph# 818-709-1244

8. Schematics

Master Controller State records

State Index	State	SPAcmd	FBAcmd	STMcmd	OBACmd	SPAcstat	FBAstat	STMstat	OBAstat	SMTest	ToSM	Tvalue	Tfunc	Sens	End	Bran	Dest
272	If SM replies '-I' branch to "End"; else fall through	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0x2D31	0xF4	0X0000	0X00	0X0000	0X0101	0X0020	338
273	Initial offset C (clinical)	0X0000	0X0000	0X0000	IC	0X00	0X00	0X00	0x33	0X0000		0 0X003B	0x44	0X0000	0x0040	0X0000	0X0000
274	Wait for OBA back to idle	0X0000	0X0000	0X0000	0x0000	0X00	0X00	0X00	0xFF	0X0000		0 0X003B	0x44	0X0000	0x0040	0X0000	0X0000
275	Wait for "image processing idle"	0X0000	0X0000	0X0000	0X0000	0x00	0x00	0X00	0X00	0x3338	0x37	0X0000	0x00	0X0000	0X001F	0X0000	0X0000
276	Start aspiration for sample transfer	AF	RF	0X0000	0X0000	0x28	0x00	0X00	0X00	0X0000		0 0x0009	0x44	0X0000	0X001F	0X0000	0X0000
277	Wait for AS and RC complete	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000		0 0x0011	0x44	0X0000	0x8606	0X0000	0X0000
278	Test Lamina Full Sensor	0X0000	0X0000	0X0000	0X0000	0X00	0x00	0X00	0X00	0X0000		0 0X0000	0X00	0x0033	0x0101	0x0001	#####
	Timer delay before capture																
279	To waste well (with Lamina fill)	P4	0X0000	0X0000	0X0000	0x15	0x00	0x00	0x00	0X0000		0 0X0062	0x43	0X0000	0X0000	0x0000	281
	Move to next tube																
280	Timer delay before capture																
	To waste well (no Lamina fill)	P2	0X0000	0X0000	0X0000	0x15	0x00	0x00	0x00	0X0000		0 0X0062	0x42	0X0000	0X0000	0x0000	0X0000
281	Move to next tube																
281	Timer delay before capture	0X0000	0X0000	0X0000	0X0000	0x00	0x00	0x00	0x00	0X0000		0 0X0062	0x42	0X0000	0X0000	0x0000	0X0000
282	ClinicalFW1_AF	0X0000	0X0000	0X0000	NC	0X00	0x28	0X00	0x33	0X0000		0 0X0041	0x44	0X0000	0x0040	0X0000	0X0000
283	Wait for OBA back to idle	0X0000	0X0000	0X0000	0x0000	0X00	0X00	0X00	0xFF	0X0000		0 0X003B	0x44	0X0000	0x0040	0X0000	0X0000
	Capture sample frames ("SMCSatNextAutoFocusPosition") and wait for sample frame capture complete.	0X0000															
284			0X0000	0X0000	0X0000	0x00	0X00	0X00	0X00	0X3036	0X8D	0x0000	0x00	0x0000	0x0010	0x0000	0X0000
	If SM argument to "DoneGatheringImages" is '00' branch to Forward1OnFocusMotor; else fall through	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X3030	0xF6	0X0000	0X00	0X0000	0X0101	0X0020	282
285	Wait for SPA and FBA idle	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000		0 0x0011	0x44	0X0000	0X8606	0X0000	0X0000
286	Turn off EP pump on SPA, SP pump on FBA	EB	EB	0X0000	0X0000	0x34	0x00	0X00	0X00	0X0000		0 0x0009	0x44	0X0000	0X001F	0X0000	0X0000
287	Wait for EB's complete (SPA and FBA)	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000		0 0x0011	0x44	0X0000	0X8606	0X0000	0X0000
288	To Waste Well	P3	RD	0X0000	0X0000	0x00	0x36	0X00	0X00	0X0000		0 0x0009	0x44	0X0000	0X001F	0X0000	0X0000
289	Wait for SPA and FBA idle	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000		0 0x0011	0x44	0X0000	0X8606	0X0000	0X0000
290	Clear PipetterHome CP and SP	HC	HC	0X0000	0X0000	0x00	0x21	0X00	0X00	0X0000		0 0x0009	0x44	0X0000	0X0101	0X0000	0X0000
291	Wait for SPA and FBA idle	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000		0 0x0011	0x44	0X0000	0X8606	0X0000	0X0000
292	Send completion signal to host	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0x0000	0X87	0X0000	0X00	0X0000	0x0101	0x0000	0x0000
293	Wait for AF and RF complete	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000		0 0x0011	0x44	0X0000	0x8606	0X0000	0X0000
294	Branch to AutoFocusReadyForCommand	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000		0 0X0000	0X00	0X0000	0X0101	0X0000	155
295	HandleStrobe: wait for strobe setting	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0x3130		0 0X0044	0x44	0X0000	0X001F	0x0000	0x0000
296	Pause for it to take effect	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0x0000		0 0X0045	0x42	0X0000	0X001F	0x0000	0x0000
297	Send strobe setting to SM	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0x3034	0x8B	0X0000	0X00	0X0000	0x0000	0x001F	183
298	AutoFocusCoarseFinalOffset	0X0000	0X0000	0X0000	BA	0X00	0X00	0X00	0x33	0X0000		0 0x2000	0x04	0X0000	0x0040	0X0000	0X0000
299	Wait for OBA and Branch to AutoFocusReadyForCommand	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0xFF	0X0000		0 0x0011	0x44	0X0000	0x0040	0x0040	155
300	AutoFocusPeakFinalOffset	0X0000	0X0000	0X0000	BB	0X00	0X00	0X00	0x33	0X0000		0 0x2000	0x04	0X0000	0x0040	0X0000	0X0000
301	Wait for OBA and Branch to AutoFocusReadyForCommand	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0xFF	0X0000		0 0x0011	0x44	0X0000	0x0040	0x0040	155
302	AutoFocusClinicalFinalOffset	0X0000	0X0000	0X0000	BC	0X00	0X00	0X00	0x33	0X0000		0 0x2000	0x04	0X0000	0x0040	0X0000	0X0000
303																	

Diagram drawings may change without notice. Please contact IRIS Diagnostics to determine the current revision level.

IRIS Diagnostics
9172 Eton Ave
Chatsworth,
Ca 91311
Ph# 818-709-1244

8. Schematics

Master Controller State records

State Index	State	SPAcmd	FBAcmd	STMcmd	OBAcmd	SPAstat	FBAstat	STMstat	OBAstat	SMTest	ToSM	Tvalue	Tfunc	Sens	End	Bran	Dest
304	Wait for OBA and Branch to AutoFocusReadyForCommand	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0xFF	0X0000	0	0x0011	0x44	0X0000	0x0040	0x0040	155
305	AutoFocusForward1	0X0000	0X0000	0X0000	F0	0X00	0X00	0X00	0x33	0X0000	0	0x2000	0x04	0X0000	0x0040	0X0000	0X0000
306	Wait for OBA and Branch to AutoFocusReadyForCommand	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0xFF	0X0000	0	0x0011	0x44	0X0000	0x0040	0x0040	155
307	AutoFocusForward2	0X0000	0X0000	0X0000	F1	0X00	0X00	0X00	0x33	0X0000	0	0x2000	0x04	0X0000	0x0040	0X0000	0X0000
308	Wait for OBA and Branch to AutoFocusReadyForCommand	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0xFF	0X0000	0	0x0011	0x44	0X0000	0x0040	0x0040	155
309	AutoFocusForward4	0X0000	0X0000	0X0000	F2	0X00	0X00	0X00	0x33	0X0000	0	0x2000	0x04	0X0000	0x0040	0X0000	0X0000
310	Wait for OBA and Branch to AutoFocusReadyForCommand	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0xFF	0X0000	0	0x0011	0x44	0X0000	0x0040	0x0040	155
311	AutoFocusForward8	0X0000	0X0000	0X0000	F3	0X00	0X00	0X00	0x33	0X0000	0	0x2000	0x04	0X0000	0x0040	0X0000	0X0000
312	Wait for OBA and Branch to AutoFocusReadyForCommand	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0xFF	0X0000	0	0x0011	0x44	0X0000	0x0040	0x0040	155
313	AutoFocusForward16	0X0000	0X0000	0X0000	F4	0X00	0X00	0X00	0x33	0X0000	0	0x2000	0x04	0X0000	0x0040	0X0000	0X0000
314	Wait for OBA and Branch to AutoFocusReadyForCommand	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0xFF	0X0000	0	0x0011	0x44	0X0000	0x0040	0x0040	155
315	AutoFocusForward32	0X0000	0X0000	0X0000	F5	0X00	0X00	0X00	0x33	0X0000	0	0x2000	0x04	0X0000	0x0040	0X0000	0X0000
316	Wait for OBA and Branch to AutoFocusReadyForCommand	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0xFF	0X0000	0	0x0011	0x44	0X0000	0x0040	0x0040	155
317	AutoFocusForward64	0X0000	0X0000	0X0000	F6	0X00	0X00	0X00	0x33	0X0000	0	0x2000	0x04	0X0000	0x0040	0X0000	0X0000
318	Wait for OBA and Branch to AutoFocusReadyForCommand	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0xFF	0X0000	0	0x0011	0x44	0X0000	0x0040	0x0040	155
319	AutoFocusForward128	0X0000	0X0000	0X0000	F7	0X00	0X00	0X00	0x33	0X0000	0	0x2000	0x04	0X0000	0x0040	0X0000	0X0000
320	Wait for OBA and Branch to AutoFocusReadyForCommand	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0xFF	0X0000	0	0x0011	0x44	0X0000	0x0040	0x0040	155
321	AutoFocusForward256	0X0000	0X0000	0X0000	F8	0X00	0X00	0X00	0x33	0X0000	0	0x2000	0x04	0X0000	0x0040	0X0000	0X0000
322	Wait for OBA and Branch to AutoFocusReadyForCommand	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0xFF	0X0000	0	0x0011	0x44	0X0000	0x0040	0x0040	155
323	AutoFocusForward512	0X0000	0X0000	0X0000	F9	0X00	0X00	0X00	0x33	0X0000	0	0x2000	0x04	0X0000	0x0040	0X0000	0X0000
324	Wait for OBA and Branch to AutoFocusReadyForCommand	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0xFF	0X0000	0	0x0011	0x44	0X0000	0x0040	0x0040	155
325	AutoFocusForward1024	0X0000	0X0000	0X0000	FA	0X00	0X00	0X00	0x33	0X0000	0	0x2000	0x04	0X0000	0x0040	0X0000	0X0000
326	Wait for OBA and Branch to AutoFocusReadyForCommand	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0xFF	0X0000	0	0x0011	0x44	0X0000	0x0040	0x0040	155
327	AutoFocusForward2048	0X0000	0X0000	0X0000	FB	0X00	0X00	0X00	0x33	0X0000	0	0x2000	0x04	0X0000	0x0040	0X0000	0X0000
328	Wait for OBA and Branch to AutoFocusReadyForCommand	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0xFF	0X0000	0	0x0011	0x44	0X0000	0x0040	0x0040	155
329	Branch to "16" (Go Resume)	0X0000	0X0000	MN	0X0000	0X00	0X00	0x32	0X00	0X0000	0	0x0009	0x44	0X0000	0X0000	0X0101	0x3136
330	Branch to "16" (Go Resume)	0X0000	0X0000	MN	0X0000	0X00	0X00	0x32	0X00	0X0000	0	0x0009	0x44	0X0000	0X0000	0X0101	0x3136
331	ValidateFocusPosition: Wait for OBA idle.	0X0000	0X0000	0X0000	0x0000	0X00	0X00	0X00	0xFF	0X0000	0	0x2000	0x04	0X0000	0x0040	0X0000	0X0000
332	Validate current focus position (must be "in first quadrant")	0X0000	0X0000	0X0000	VP	0X00	0X00	0X00	0x00	0X0000	0	0x2000	0x04	0X0000	0x0101	0X0000	0X0000
333	AF_Validate1: If 31 ("good") from OBA goto AF_IsValid	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0x00	0x31	0X0000	0x00	0X0000	0X00	0X0000	0x4040	0x0040	336
334	If 30 ("bad") from OBA goto AF_IsNotValid	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0x00	0x30	0X0000	0x00	0X0000	0X00	0X0000	0x4040	0x0040	337
335	Loop Back to AF_Validate1	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000	0	0X0000	0X00	0X0000	0X001F	0X0101	333

Diagram drawings may change without notice. Please contact IRIS Diagnostics to determine the current revision level.

IRIS Diagnostics
9172 Eton Ave
Chatsworth,
Ca 91311
Ph# 818-709-1244

8. Schematics

Master Controller State records

State Index	State	SPAcmd	FBAcmd	STMcmd	OBAcmd	SPAstat	FBAstat	STMstat	OBAstat	SMTTest	ToSM	Tvalue	Tfunc	Sens	End	Bran	Dest
	AF_IsValid: send eFocusPositionIsValid (0x29) to host and goto AutoFocusReadyForCommand	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000	0x29	0x0020	0x03	0X0000	0X0000	0x0000	155
336	AF_IsNotValid: send eFocusPositionIsValid (0x28) to host and goto AutoFocusReadyForCommand	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000	0x28	0x0020	0x03	0X0000	0X0000	0x0000	155
337	End "I7" (AutoFocus control)	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000		0 0x00A0	0x04	0X0000	0x0000	0X0000	0X0000
338	Start new IDLE	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0XFF	0X00	0X0000		0 0x0011	0x44	0X0000	0X001F	0X0000	0X0000
339	Send synch command to host																
340	Wait for SM command	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0x00	0X00	0X0000	0x2c	0X004A	0x42	0X0000	0x0080	0x0080	0X0000
341	Tell STM to look for Racks	0X0000	0X0000	WR	0X0000	0X00	0X00	0X00	0X00	0X0000		0 0X004B	0x44	0X0000	0X0101	0X0000	0X0000
342	Wait for button or Rack	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X52	0X00	0X0000		0 0X004C	0x42	0X0032	0X0000	0x0009	346
	Send synch command to host																
343	Wait for SM command	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0x00	0X00	0X0000	0x2c	0X004D	0x42	0X0000	0x0080	0x0080	0X0000
344	Branch to Shutdown if Standby period	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000		0 0X0000	0X00	0x9000	0x0101	0X0001	0X5344
345	Unconditionally branch to End IDLE	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000		0 0X0000	0X00	0X0000	0X0000	0X0101	351
346	Acknowledge STM with GoNext command	0X0000	0X0000	GN	0X0000	0X00	0X00	0xFF	0X00	0X0000		0 0X0000	0X00	0x0000	0x0008	0x0000	0x0000
347	Branch to Wakeup Long if long Standby	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000		0 0X0000	0X00	0x9000	0X0101	0x0001	0X574C
348	Branch to Wakeup Medium if intermediate	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000		0 0X0000	0X00	0x9000	0x0101	0x0001	0X574D
349	Branch unconditionally to Wakeup short	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000		0 0X0000	0X00	0X0000	0X001F	0X0000	0X0000
350	Timeout -- go to real IDLE	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000		0 0X0000	0X00	0X0000	0X001F	0X0000	0X0000
351	Start PI: To test tube;also start WA(wash)	P1	0X0000	0X0000	0X0000	0x11	0x00	0X00	0X00	0X0000	0x33	0x0009	0x44	0X0000	0X001F	0X0000	0X0000
352		0X0000	0X0000	0X0000	0X0000	0xFF	0x00	0X00	0X00	0X0000		0x0011	0x44	0X0000	0X001F	0X0000	0X0000
353	Start Lamina for background capture	SB	0X0000	0X0000	0X0000	0x31	0X00	0X00	0X00	0X0000	0x32	0x0009	0x44	0X0000	0X001F	0X0000	0X0000
354	Wait for SB complete	0X0000	0X0000	0X0000	0X0000	0xFF	0x00	0X00	0X00	0X0000	0x32	0x0011	0x44	0X0000	0X001F	0X0000	0X0000
355	Timer Delay	0X0000	0X0000	0X0000	0X0000	0x00	0x00	0x00	0x00	0X0000	0x32	0X004E	0x42	0x0000	0X0010	0x0000	0x4258
356	Turn off EP pump on SPA	EB	0X0000	0X0000	0X0000	0x34	0x00	0X00	0X00	0X0000	0x32	0x0009	0x44	0X0000	0x001F	0X0000	0X0000
357	Wait for EB complete	0X0000	0X0000	0X0000	0X0000	0xFF	0x00	0X00	0X00	0X0000	0x32	0x0011	0x44	0X0000	0X001F	0X0000	0X0000
358	Start aspiration for sample transfer	AS	RC	0X0000	0X0000	0x17	0x00	0X00	0X00	0X0000	0x32	0x0009	0x44	0X0000	0X001F	0X0000	0X0000
359	Wait for AS and RC complete	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000	0x32	0x0011	0x44	0X0000	0x8606	0X0000	0X0000
360	Test Lamina Full Sensor	0X0000	0X0000	0X0000	0X0000	0X00	0x00	0X00	0X00	0X0000	0x32	0X0000	0X00	0x0033	0x0101	0x0001	#####
361	To waste well (with Lamina fill)																
	Move to next tube																
362	Wait for simulated image capture period	P4	0X0000	MN	0X0000	0x15	0x00	0x00	0x00	0X0000	0x32	0X0065	0x43	0X0000	0X0000	0x0000	364
	To waste well (no Lamina fill)																
363	Move to next tube																
364	Wait for simulated image capture period	P2	0X0000	MN	0X0000	0x15	0x00	0x00	0x00	0X0000	0x32	0X0065	0x42	0X0000	0X0000	0x0000	0X0000
365	Wait for SPA, FBA, and STM idle	0X0000	0X0000	0X0000	0X0000	0xFF	0XFF	0XFF	0X00	0X0000	0x32	0x0011	0x44	0X0000	0x8E0E	0X0000	0X0000
366	Turn off EP pump on SPA, SP pump on FBA	EB	EB	0X0000	0X0000	0x34	0x00	0X00	0X00	0X0000	0x32	0x0009	0x44	0X0000	0X001F	0X0000	0X0000
367	Wait for EB's complete (SPA and FBA)	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000	0x32	0x0011	0x44	0X0000	0X8606	0X0000	0X0000
368	Drain Flowcell	DF	0x0000	0X0000	0X0000	0X26	0x00	0X00	0X00	0X0000	0x32	0x0009	0x44	0X0000	0X001F	0X0000	0X0000
369	Prime Lamina Supply Line	0X0000	0X0000	0X0000	0X0000	0xFF	0x00	0X00	0X00	0X0000	0x32	0x0011	0x44	0X0000	0X001F	0X0000	0X0000
370	Prime All Pumps	PS	0X0000	0X0000	0X0000	0x20	0x00	0X00	0X00	0X0000	0x32	0x0009	0x44	0X0000	0X001F	0X0000	0X0000
371	Wait for SPA and FBA idle	PP	0X0000	0X0000	0X0000	0xFF	0x00	0X00	0X00	0X0000	0x32	0x0011	0x44	0X0000	0X001F	0X0000	0X0000
372		0X0000	PC	0X0000	0X0000	0X21	0x00	0X00	0X00	0X0000	0x32	0x0009	0x44	0X0000	0X001F	0X0000	0X0000

Diagram drawings may change without notice. Please contact IRIS Diagnostics to determine the current revision level.

IRIS Diagnostics
9172 Eton Ave
Chatsworth,
Ca 91311
Ph# 818-709-1244

8. Schematics

Master Controller State Records

State Index	State	SPAcmd	FBAcmd	STMcmd	OBACmd	SPAcstat	FBAstat	STMstat	OBAsat	SMTstat	ToSM	Tvalue	Tfunc	Sens	End	Bran	Dest
373	Prime Inner Lines #1	TR	PL	0X0000	0X0000	0x00	0x24	0X00	0X00	0X0000	0x32	0x0009	0x44	0X0000	0X001F	0X0000	0X0000
374	Wait for SPA and FBA idle	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000	0x32	0x0011	0x44	0X0000	0x8606	0X0000	0X0000
375	Prime Inner Lines #2	PL	0x0000	0X0000	0X0000	0X22	0x00	0X00	0X00	0X0000	0x32	0x0009	0x44	0X0000	0X001F	0X0000	0X0000
376		0X0000	0X0000	0X0000	0X0000	0xFF	0x00	0X00	0X00	0X0000	0x32	0x0011	0x44	0X0000	0X001F	0X0000	0X0000
377	Prime Aspiration Line	TR	PA	0X0000	0X0000	0X00	0x26	0X00	0X00	0X0000	0x32	0x0009	0x44	0X0000	0X001F	0X0000	0X0000
378	Wait for SPA and FBA idle	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000	0x32	0x0011	0x44	0X0000	0x8606	0X0000	0X0000
	Rinse and De-bubble																
379	Rotate Pipetter to tube (during de-bubble)	P5	RD	0X0000	0X0000	0x00	0x36	0X00	0X00	0X0000	0x32	0x0009	0x44	0X0000	0X001F	0X0000	0X0000
380	Wait for SPA and FBA idle	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000	0x32	0x0011	0x44	0X0000	0x8606	0X0000	0X0000
381	Start home EP / wash flow cell																
382	Start SP Home move	HC	HC	0X0000	0X0000	0x00	0x21	0X00	0X00	0X0000	0x32	0x0009	0x44	0X0000	0x0101	0X0000	0X0000
383	Wait for SPA and FBA idle	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000	0x32	0x0011	0x44	0X0000	0x8606	0X0000	0X0000
384	Branch to "16" (Go Resume)	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000	0x32	0X0000	0X00	0X0000	0X0000	0X0101	0x3136
384	End WA (Wash)																
385	Start ZZ (Sleep)	0X0000	0X0000	0X0000	0X0000	0x00	0x00	0X00	0X00	0X0000	0xFF	0X0000	0X00	0X0000	0x0000	0x0080	0x0000
386	End ZZ (Sleep)	0X0000	0X0000	0X0000	0X0000	0x00	0x00	0X00	0X00	0X0000	0xFF	0X0000	0X00	0X0000	0x0000	0X0000	0X0000
387	Start SS: Reset HLCs	RE	RE	RE	RE	0xFF	0xFF	0XFF	0XFF	0X0000		0 0X0052	0x44	0X0000	0XCA4A	0X0000	0X0000
	Set front panel lights (button green, LED blue)	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0XFF	0X00	0X0000		0 0X0000	0X00	0X6000	0X005F	0X0000	0X0000
388																	
	Tell STM to find first rack, FBA sets CP and SP to initial positions, SPA Initializes Pipette position, sets EP to initial position.																
389		P0	HP		0X0000	0x12	0X00	0X00	0X00	0X0000		0 0x0009	0x44	0X0000	0x001F	0X0000	0X0000
390	If STM idle (rack found as a result of M1) goto HaveRack	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0XFF	0X00	0X0000		0 0X0000	0X00	0X0000	0X0101	0X0008	394
391	No rack -- EndSSBranchTarget	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X39	0X00	0X0000		0 0X0000	0X00	0X0000	0X0101	0X0008	416
392	Delay and let host know we're alive	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000	0x32	0x0008	0x02	0X0000	0x0000	0x0000	0x0000
393	Loop Back	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000		0 0X0000	0X00	0X0000	0X001F	0X0101	390
	WaitUntilSTMAtIdle_SS (wait for SPA idle as well)	0X0000	0X0000	0X0000	0X0000	0xFF	0X00	0XFF	0X00	0X0000		0 0X0053	0x44	0X0000	0x8A0A	0X0000	0X0000
394		P1		0X0000	0X0000	0x11	0x00	0X00	0X00	0X0000		0 0x0009	0x44	0X0000	0X001F	0X0000	0X0000
395	To test tube	0X0000	0X0000	0X0000	0X0000	0xFF	0x00	0X00	0X00	0X0000		0 0x0011	0x44	0X0000	0X001F	0X0000	0X0000
396																	
397	Start Lamina for background capture	SB	0X0000	0X0000	0X0000	0x31	0X00	0X00	0X00	0X0000		0 0x0009	0x44	0X0000	0x001F	0X0000	0X0000
398	Wait for SB complete	0X0000	0X0000	0X0000	0X0000	0xFF	0x00	0X00	0X00	0X0000		0 0x0011	0x44	0X0000	0X001F	0X0000	0X0000
399	Timer delay	0X0000	0X0000	0X0000	0X0000	0x00	0x00	0x00	0x00	0X0000		0 0x0055	0x42	0X0000	0x0000	0x0000	0X0000
400	Turn off EP pump on SPA	EB	0X0000	0X0000	0X0000	0x34	0x00	0X00	0X00	0X0000		0 0x0009	0x44	0X0000	0x001F	0X0000	0X0000
401	Wait for EB complete	0X0000	0X0000	0X0000	0X0000	0xFF	0x00	0X00	0X00	0X0000		0 0x0011	0x44	0X0000	0X001F	0X0000	0X0000
402	Start aspiration for sample transfer	AS	RC	0X0000	0X0000	0x17	0x00	0X00	0X00	0X0000		0 0x0009	0x44	0X0000	0X001F	0X0000	0X0000
403	Wait for AS and RC complete	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000		0 0x0011	0x44	0X0000	0x8606	0X0000	0X0000
404	Test Lamina Full Sensor	0X0000	0X0000	0X0000	0X0000	0X00	0x00	0X00	0X00	0X0000		0 0X0000	0X00	0x0033	0x0101	0x0001	#####
	To waste well (with Lamina fill) Move to next tube																
405	Wait for simulated image capture period	P4	0X0000	MN	0X0000	0x15	0x00	0x00	0x00	0X0000		0 0X0065	0x43	0X0000	0X0000	0x0000	407
	To waste well (no Lamina fill) Move to next tube																
406	Wait for simulated image capture period	P2	0X0000	MN	0X0000	0x15	0x00	0x00	0x00	0X0000		0 0X0065	0x42	0X0000	0X0000	0x0000	0X0000
407	Wait for SPA, FBA, and STM idle	0X0000	0X0000	0X0000	0X0000	0xFF	0XFF	0XFF	0X00	0X0000		0 0x0011	0x44	0X0000	0x8E0E	0X0000	0X0000

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IRIS Diagnostics
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8. Schematics

Master Controller State Records

State Index	State	SPACmd	FBAcmd	STMcmd	OBAcmd	SPAstat	FBAstat	STMstat	OBAstat	SMTest	ToSM	Tvalue	Tfunc	Sens	End	Bran	Dest
408	Turn off EP pump on SPA, SP pump on FBA	EB	EB	0X0000	0X0000	0x34	0x00	0X00	0X00	0X0000	0	0 0x0009	0x44	0X0000	0X001F	0X0000	0X0000
409	Wait for EB's complete (SPA and FBA)	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000	0	0 0x0011	0x44	0X0000	0X8606	0X0000	0X0000
410	To Waste Well	P5	RD	0X0000	0X0000	0x00	0x36	0X00	0X00	0X0000	0	0 0x0009	0x44	0X0000	0X001F	0X0000	0X0000
411	Wait for SPA and FBA idle	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000	0	0 0x0011	0x44	0X0000	0X8606	0X0000	0X0000
412	Clear Pipetter/Home CP and SP/Move to Next Tube	HC	HC	0X0000	0X0000	0x00	0x21	0X00	0X00	0X0000	0x36	0x0009	0x44	0X0000	0x0101	0X0000	0X0000
413		0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0XFF	0X00	0X0000	0	0 0x0011	0x44	0X0000	0X8E0E	0X0000	0X0000
414	Send CR to STM; Home Pipetter	PH	0X0000	CR	0X0000	0X00	0X00	0X33	0X00	0X0000	0	0 0x0009	0x44	0X0000	0X001F	0X0000	0X0000
415	Home STM carriers	0X0000	0X0000	0x0000	0X0000	0xFF	0X00	0XFF	0X00	0X0000	0x2F	0X0059	0x44	0X0000	0X8A0A	0X0000	0X0000
416	End of SS sequence	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000	0	0 0X0000	0X00	0X0000	0X001F	0X0000	0X0000
417	SW Wakeup from short standby period - Turn strobe on	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000	0	0 0X0000	0X00	0X7046	0X0101	0X0000	0X0000
418		0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000	0	0 0X0000	0X00	0X0000	0X0101	0X0000	0X0000
419		0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000	0	0 0X0000	0X00	0X0000	0X0101	0X0000	0X0000
420	Unconditionally Branch to GO	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000	0	0 0X0000	0X00	0X0000	0x0000	0x0101	0X474F
421	End of SW	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000	0	0 0X0000	0X00	0X0000	0X0101	0X0000	0X0000
422	MW Wakeup from intermediate standby period - Turn strobe on	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000	0	0 0X0000	0X00	0X7046	0X0101	0X0000	0X0000
423		0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000	0	0 0X0000	0X00	0X0000	0X0101	0X0000	0X0000
424		0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000	0	0 0X0000	0X00	0X0000	0X0101	0X0000	0X0000
425	Unconditionally Branch to GO	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000	0	0 0X0000	0X00	0X0000	0x0000	0x0101	0X474F
426	End of MW	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000	0	0 0X0000	0X00	0X0000	0X0101	0X0000	0X0000
427	LW Wakeup from long standby period - Turn strobe on	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000	0	0 0X0000	0X00	0X7046	0X0101	0X0000	0X0000
428		0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000	0	0 0X0000	0X00	0X0000	0X0101	0X0000	0X0000
429		0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000	0	0 0X0000	0X00	0X0000	0X0101	0X0000	0X0000
430	Unconditionally Branch to GO	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000	0	0 0X0000	0X00	0X0000	0x0000	0x0101	0X474F
431	End of LW	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000	0	0 0X0000	0X00	0X0000	0X0101	0X0000	0X0000
432	SD Shutdown - Auto shutdown after standby timer expired	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000	0	0 0X0000	0X00	0XB030	0x0001	0X0101	435
433	Turn strobe off	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000	0	0 0X0000	0X00	0X7000	0X0101	0X0000	0X0000
434		0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000	0	0 0X0000	0X00	0X0000	0X0101	0X0000	0X0000
435	End of SD	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X00	0X0000	0	0 0X0000	0X00	0X0000	0X0101	0X0000	0X0000
436	Start DL (Diluent); To test tube	P1	0X0000	0X0000	0X0000	0x11	0x00	0X00	0X00	0X0000	0x34	0x0009	0x44	0X0000	0X001F	0X0000	0X0000
437		0X0000	0X0000	0X0000	0X0000	0xFF	0x00	0X00	0X00	0X0000	0x32	0x0011	0x44	0X0000	0X001F	0X0000	0X0000
438	Start Lamina for background capture	SB	0X0000	0X0000	0X0000	0x31	0X00	0X00	0X00	0X0000	0x32	0x0009	0x44	0X0000	0x001F	0X0000	0X0000
439	Wait for SB complete	0X0000	0X0000	0X0000	0X0000	0xFF	0x00	0X00	0X00	0X0000	0x32	0x0011	0x44	0X0000	0X001F	0X0000	0X0000
440	Timer delay	0X0000	0X0000	0X0000	0X0000	0x00	0x00	0x00	0x00	0X0000	0x32	0X005A	0x42	0X0000	0x0000	0x0000	0X0000
441	Turn off EP pump on SPA	EB	0X0000	0X0000	0X0000	0x34	0x00	0X00	0X00	0X0000	0x32	0x0009	0x44	0X0000	0x001F	0X0000	0X0000
442	Wait for EB complete	0X0000	0X0000	0X0000	0X0000	0xFF	0x00	0X00	0X00	0X0000	0x32	0x0011	0x44	0X0000	0X001F	0X0000	0X0000
443	Start aspiration for sample transfer	AS	RC	0X0000	0X0000	0x17	0x00	0X00	0X00	0X0000	0x32	0x0009	0x44	0X0000	0X001F	0X0000	0X0000
444	Wait for AS and RC complete	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000	0x32	0x0011	0x44	0X0000	0x8606	0X0000	0X0000
445	Test Lamina Full Sensor	0X0000	0X0000	0X0000	0X0000	0X00	0x00	0X00	0X00	0X0000	0x32	0X0000	0X00	0x0033	0x0101	0x0001	#####
	To waste well (with Lamina fill) Move to next tube																
446	Wait for simulated image capture period	P4	0X0000	MN	0X0000	0x15	0x00	0x00	0x00	0X0000	0x32	0X0065	0x43	0X0000	0X0000	0x0000	448

Diagram drawings may change without notice. Please contact IRIS Diagnostics to determine the current revision level.

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Master Controller State Records

State Index	State	SPAcmd	FBAcmd	STMcmd	OBAcmd	SPAcstat	FBAstat	STMstat	OBAstat	SMTest	ToSM	Tvalue	Tfunc	Sens	End	Bran	Dest
	To waste well (no Lamina fill) Move to next tube																
447	Wait for simulated image capture period	P2	0X0000	MN	0X0000	0x15	0x00	0x00	0x00	0X0000	0x32	0X0065	0x42	0X0000	0X0000	0x0000	0X0000
448	Wait for SPA, FBA, and STM idle	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0xFF	0X00	0X0000	0x32	0x0011	0x44	0X0000	0x8E0E	0X0000	0X0000
	Turn off EP pump on SPA, SP pump on FBA	EB	EB	0X0000	0X0000	0x34	0x00	0X00	0X00	0X0000	0x32	0x0009	0x44	0X0000	0X001F	0X0000	0X0000
450	Wait for EB's complete (SPA and FBA)	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000	0x32	0x0011	0x44	0X0000	0X8606	0X0000	0X0000
451	To Waste Well	P5	RD	0X0000	0X0000	0x00	0x36	0X00	0X00	0X0000	0x32	0x0009	0x44	0X0000	0X001F	0X0000	0X0000
452	Wait for SPA and FBA idle	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000	0x32	0x0011	0x44	0X0000	0x8606	0X0000	0X0000
453	Clear Pipetter/Home CP and SP	HC	HC	0x0000	0X0000	0x00	0x21	0X00	0X00	0X0000	0x32	0x0009	0x44	0X0000	0x0101	0X0000	0X0000
454	Wait for SPA and FBA idle	0X0000	0X0000	0X0000	0X0000	0xFF	0xFF	0X00	0X00	0X0000	0x32	0x0011	0x44	0X0000	0x8606	0X0000	0X0000
	Retrieve tube number; branch to Kill ("KL") if 10 (0x0A), term otherwise																
455	Branch to "16" (Go Resume)	0X0000	0X0000	0X0000	0X0000	0x00	0X00	0X00	0X00	0X0000	0x32	0X005D	0x44	0X0000	0X0101	0X0008	0x4B4C
456	End of DL sequence	0X0000	0X0000	0X0000	0X0000	0x00	0X00	0X00	0X00	0X0000	0x32	0X0000	0X00	0X0000	0X0000	0X0101	0x3136
	Start KL (Kill); Send CR to STM; HS to FBA+C240; Home Pipettor; flash STANDBY	PH	HS	CR	0X0000	0x12	0x21	0X33	0X00	0X0000		0	0x0009	0x44	0x0000	0x8E0E	0X0000
458	Flash STANDBY	0x0000	0X0000	0X0000	0X0000	0x00	0x00	0X00	0X00	0X0000	0x00	0x0000	0x00	0x6001	0x0101	0X0000	0X0000
	Send SMC'SInShutdown message to SM; no exit condition!	0x0000	0X0000	0X0000	0X0000	0x00	0x00	0X00	0X00	0X0000	0x35	0x0000	0x00	0X0000	0x0000	0X0000	0X0000
460	End of KL sequence	0X0000	0X0000	0X0000	0X0000	0x00	0X00	0X00	0X00	0X0000		0	0X0000	0X00	0X0000	0X0000	0X0000
461	BX Background Error Exit	EB	EB	0X0000	0X0000	0x00	0X00	0X00	0X00	0X0000		0	0x0009	0x44	0X0000	0X0000	0X0000
462	Dummy	0X0000	0X0000	0X0000	0X0000	0x00	0X00	0X00	0X00	0X0000	0	0X0000	0X00	0X0000	0X001F	0X0000	0X0000

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SPA State records

State Order	State	On (Hex)	Off (Hex1)	Off (Hex2)	Off (Hex3)	Off (Hex4)	EP	SPA, V, Motor	SPA, H, Motor	SP	Sensor Select	Sensor State	Sensor Mask	Motor Test	SM Test	ToSM	TValue	TFunc	End Ctrl	Brn Ctrl	Dest
0	IDLE	00000000	FF	FF	FF	FF	080AF7FF	0	0	0	0000	0	0	0	0x0000	0xFF	0x0000	0x0	0x0007	0x0000	0x0000
1	"T1" Home Evacuation Pump / Rotate out to tube	00040081	FF	FF	FF	FF	FFFFFFFF CA4B	0	EC41	0	0000	0	0	88	0x0000	0x11	0x0095	0x44	0x0007	0x0000	0x0000
2	Dummy	00000000	FF	F7	FF	7E	FFF7F7FE	0	0	0	0000	0	0	00	0x0000	0x11	0x0000	0x0	0x0007	0x0000	0x0000
3	"PH" Home Vertical TO Lift Pipetter AND SEND PIPETER BACK TO Park sensor then to WASTE WELL	00020000	FF	FF	FF	FF	FFFFFFFF 80FD	80FE	80FF	0	0000	0	0	FC	0x0000	0x12	0x0035	0x44	0x0007	0x0000	0x0000
4	Home Rotational Motor to back sensor	00000000	FF	FF	FF	FF	FFFFFFFF	0	0	0	0000	0	0	0C	0x0000	0x12	0x0095	0x44	0x0007	0x0000	0x0000
5	Rotate out -3 deg to waste well	00000000	FF	FF	FF	FF	FFFFFFFF	0	0	0	0000	0	0	08	0x0000	0x12	0x0035	0x44	0x0007	0x0000	0x0000
6	Down to offset from vertical home	00000000	FF	FF	FF	FF	FFFFFFFF	80FF	866F	0	0000	0	0	E0	0x0000	0x12	0x0035	0x44	0x0007	0x0000	0x0000
7	Checking pressure	00000080	FF	FD	FF	FF	FFFDFFFF	0	0	0	1080	6	54	00	0x0000	0x12	0x0000	0x0	0x0001	0x0101	9
8	Recharge	00040000	FF	FF	FF	FF	FFFFFFFF	0	0	0	1080	5	54	00	0x0000	0x12	0x0088	0x44	0x0001	0x0000	0x0000
9	Dummy	00020000	FF	F9	FF	7F	FFFBFFFF	80FF	0	0	0000	0	0	00	0x0000	0x12	0x0000	0x0	0x0007	0x0000	0x0000
10	"TD"- Down to test tube	00040000	FF	FF	FF	FF	FFFFFFFF	0	D543	0	0000	0	0	20	0x0000	0x13	0x0095	0x44	0x0007	0x0000	0x0000
11	Dummy	00000000	FF	F7	FF	FF	FFF7FFFF	80FF	0	0	0000	0	0	00	0x0000	0x13	0x0000	0x0	0x0007	0x0000	0x0000
12	Start"AS"-stop EP pump and SBV	00020030	FF	FF	FF	FF	FFFFFFFF	0	0	0	0000	0	0	00	0x0000	0x15	0x002E	0x02	0x0101	0x0000	0x0000
13	Aspirate to beginning of Flow Cell	00000084	FF	FF	FF	FF	FFFFFFFF	0	0	0	0000	0	0	20	0x0000	0x15	0x0095	0x44	0x0007	0x0000	0x0000
14	Activate SBV to fill flow cell while pulling EP during fast push of CP	00000010	FF	FD	FF	5B	FFFDFF5B	4022	0	0	0000	0	0	00	0x0000	0x17	0x0025	0x42	0x0000	0x0000	0x0000
15	Activate SBV to fill flow cell while pulling EP during slow push of CP during analysis	00000000	FF	FF	FF	FF	FFFFFFFF	4010	0	0	0000	0	0	00	0x0000	0x17	0x0000	0x00	0x0101	0x0000	0x0000
16	Dummy	00000000	FF	FF	FF	FF	FFFFFFFF	0	0	0	0000	0	0	00	0x0000	0x17	0x0000	0x0	0x0101	0x0000	0x0000
17	"TW"- Start Lift Pipetter to top and delay	00020000	FF	FF	FF	FF	FFFFFFFF	0	D560	0	0000	0	0	0	0x0000	0x15	0x002E	0x02	0x0101	0x0000	0x0000
18	Spit air until pipette lift complete	00000040	FF	FF	FF	FF	FFFFFFFF	0	0	0	0000	0	0	20	0x0000	0x15	0x0095	0x44	0x0007	0x0000	0x0000
19	Rotate In to Waste Well	00000000	FF	FF	FF	BF	FFFFFFFFBF	0	EC42	0	0000	0	0	08	0x0000	0x15	0x0085	0x44	0x0007	0x0000	0x0000
20	Down to Waste Well	00000000	FF	FF	FF	FF	FFFFFFFF	0	D547	0	0000	0	0	20	0x0000	0x15	0x0095	0x44	0x0007	0x0000	0x0000
21	Dummy	00000000	FF	FF	FF	FF	FFFFFFFF	0	0	0	0000	0	0	00	0x0000	0x15	0x0000	0x0	0x0101	0x0000	0x0000
22	"CP" Clean Flowcell Window for 2 sec - Start lift pipetter to top and delay	00020030	FF	FF	FF	FF	FFFFFFFF 80FD	D66E	0	0	0000	0	0	0	0x0000	0x16	0x002E	0x02	0x0000	0x0000	0x0000
23	Clear Pipetter until pipette lift and EP home complete	00000040	FF	FF	FF	FF	FFFFFFFF	0	0	0	0000	0	0	E0	0x0000	0x16	0x0095	0x44	0x0007	0x0000	0x0000
24	Dummy	00000000	FF	FF	FF	FF	FFFFFFFF8F	80FF	0	0	0000	0	0	00	0x0000	0x16	0x0000	0x0	0x0007	0x0000	0x0000
25	"PS" Prime Lamina Supply Line	00030000	FF	FF	FF	FF	FFFFFFFF	80FF	0	0	0000	0	0	00	0x0000	0x20	0x0028	0x42	0x0000	0x0000	0x0000
26	Dummy	00000000	FF	FE	FF	FF	FFFEFFFF	80FF	0	0	0000	0	0	00	0x0000	0x20	0x0000	0x0	0x0007	0x0000	0x0000
27	"PP"- Prime Evacuation Pump	00020001	FF	FF	FF	FF	FFFFFFFF D758	0	0	0	0000	0	0	80	0x0000	0x21	0x0099	0x44	0x0007	0x0000	0x0000
28	Hold EBVG for 3 sec	00000000	FF	FF	FF	FF	FFFFFFFF	80FF	0	0	0000	0	0	00	0x0000	0x21	0x0029	0x42	0x0000	0x0000	0x0000
29	Dummy	00000000	FF	FF	FF	FE	FFFFFFFFFE	80FF	0	0	0000	0	0	00	0x0000	0x21	0x0000	0x0	0x0007	0x0000	0x0000
30	"PL"-Prime Inner Line #2	00020030	FF	FF	FF	FF	FFFFFFFF D85C	0	0	0	0000	0	0	80	0x0000	0x22	0x0099	0x44	0x0007	0x0000	0x0000
31	Dummy	00000000	FF	FF	FF	CF	FFFFFFCF	80FF	0	0	0000	0	0	00	0x0000	0x22	0x0000	0x0	0x0007	0x0000	0x0000
32	"TR"- Turn On Rinse Pump for 2 Sec	000B0000	FF	FF	FF	FF	FFFFFFFF	80FF	0	0	0000	0	0	00	0x0000	0x23	0x002A	0x42	0x0000	0x0000	0x0000
33	Checking pressure	00000080	FF	FC	FF	FF	FFFCFFFF	80FF	0	0	1080	6	54	00	0x0000	0x23	0x0000	0x0	0x0001	0x0101	35
34	Recharge	00040000	FF	FF	FF	FF	FFFFFFFF	80FF	0	0	1080	5	54	00	0x0000	0x23	0x0085	0x44	0x0001	0x0000	0x0000
35	Dummy	00020000	FF	F3	FF	7F	FF3FFFFF	80FF	0	0	0000	0	0	00	0x0000	0x23	0x0000	0x0	0x0007	0x0000	0x0000

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SPA State records

36	"HP" Home EP	00020001	FF	FF	FF	FF	FFFFFFF	80FD	0	0	0	0000	0	0	0	0X0000	0x24	0x0035	0x44	0xd007	0x0000	0x0000
37	Dummy	00000000	FF	FF	FF	FE	FFFFFFFE	80FF	0	0	0	0000	0	0	0	0X0000	0x24	0X0000	0X0	0xd007	0x0000	0x0000
38	"SB" Transfer Lamina During Background	00020070	FF	FF	FF	FF	FFFFFFF	0	0	0	0	0000	0	0	0	0X0000	0x31	0x0035	0x44	0xd0101	0x0000	0x0000
39	Dummy	00000000	FF	FF	FF	BF	FFFFFFBF	0	0	0	0	0000	0	0	0	0X0000	0x31	0X0000	0X0	0xd0101	0x0000	0x0000
40	"EB" End Background(EP off)	00020030	FF	FF	FF	FF	FFFFFFF	80FF	0	0	0	0000	0	0	0	0X0000	0x34	0x0035	0x44	0xd007	0x0000	0x0000
41	Dummy	00000000	FF	FF	FF	EF	FFFFFFEF	80FF	0	0	0	0000	0	0	0	0X0000	0x34	0X0000	0X0	0xd007	0x0000	0x0000
42	"DF" Drain Flowcell	00020004	FF	FF	FF	FF	FFFFFFF	DE5F	0	0	0	0000	0	0	80	0X0000	0x26	0x0035	0x44	0xd007	0x0000	0x0000
43	Dummy	00000000	FF	FF	FF	FB	FFFFFFFB	80FF	0	0	0	0000	0	0	0	0X0000	0x26	0X0000	0X0	0xd007	0x0000	0x0000
44	"IC" Home EP	00020001	FF	FF	FF	FF	FFFFFFF	80FD	0	0	0	0000	0	0	0	0X0000	0x27	0x0035	0x44	0xd007	0x0000	0x0000
45	Place Roller on Tube (EP -45 Deg)	00000000	FF	FF	FF	FF	FFFFFFF	880C	0	0	0	0000	0	0	80	0X0000	0x27	0x0035	0x44	0xd007	0x0000	0x0000
46	D own to test tube	00000004	FF	FF	FF	FE	FFFFFFFE	80FF	0x43	0	0	0000	0	0	E0	0X0000	0x27	0x0035	0x44	0xd007	0x0000	0x0000
47	W ash Flow Cell With IRISOLVE	00000000	FF	FF	FF	FF	FFFFFFF	E061	0	0	0	0000	0	0	80	0X0000	0x27	0x0039	0x44	0xd007	0x0000	0x0000
48	Dummy	00000000	FF	FF	FF	FB	FFFFFFFB	80FF	0	0	0	0000	0	0	0	0X0000	0x27	0x0000	0x0	0xd007	0x0000	0x0000
49	Start "ZZ"	00000000	FF	FF	FF	FF	0B0AF7FF	0	0	0	0	0000	0	0	0	0X0000	0xFF	0x0000	0x0	0xd0000	0x0080	0x0000
50	End "ZZ"	00000000	FF	FF	FF	FF	FFFFFFF	0	0	0	0	0000	0	0	0	0X0000	0xFF	0x0000	0x0	0xd0000	0x0000	0x0000
51	"RV" Reset Valves (subroutine to be used only during "BP" to turn off valves)	00000000	FF	FF	FF	FF	00000000	80FF	0	0	0	0000	0	0	0	0X0000	0x26	0X0000	0X0	0xd007	0x0000	0x0000
52	Dummy	00020000	FF	FF	FF	FF	FFFFFFF	80FF	0	0	0	0000	0	0	0	0X0000	0x26	0X0000	0X0	0xd007	0x0000	0x0000
53	"FP" Checking pressure	00000000	FF	FF	FF	FF	FFFFFFF	80FF	0	0	0	10B0	6	54	C0	0X0000	0x30	0X0000	0X0	0xd0011	0x0101	55
54	Recharge	00040000	FF	FF	FF	FF	FFFFFFF	80FF	0	0	0	10B0	5	54	C0	0X0000	0x30	0X0000	0X0	0xd0011	0x0000	0x0000
55	Dummy	00000000	FF	FB	FF	FF	FFFBFFF	80FF	0	0	0	0000	0	0	0	0X0000	0x30	0X0000	0X0	0xd007	0x0000	0x0000
56	"G1" Turn on Lamina fill pump	000A0000	FF	FF	FF	FF	FFFFFFF	0	0	0	0	0000	0	0	0	0X0000	0x32	0x0000	0x0	0xd0101	0x0000	0x0000
57	Dummy	00000000	FF	FF	FF	FF	FFFFFFF	0	0	0	0	0000	0	0	0	0X0000	0x32	0X0000	0X0	0xd0000	0x0000	0x0000
58	"G0" Turn off Lamina fill pump	000A0000	FF	FF	FF	FF	FFFFFFF	0	0	0	0	0000	0	0	0	0X0000	0x33	0x0000	0x0	0xd0101	0x0000	0x0000
59	Dummy	00000000	FF	F7	FF	FF	FF7FFFF	0	0	0	0	0000	0	0	0	0X0000	0x33	0X0000	0X0	0xd0000	0x0000	0x0000
60	"TQ" Turn On Rice Pump for 2 Sec without fill health	00030000	FF	FF	FF	FF	FFFFFFF	80FF	0	0	0	0000	0	0	0	0X0000	0x23	0X002B	0X42	0xd0000	0x0000	0x0000
61	Checking pressure	00000080	FF	FC	FF	FF	FFFCFFF	80FF	0	0	0	10B0	6	54	C0	0X0000	0x23	0X0000	0X0	0xd0011	0x0101	63
62	Recharge	00040000	FF	FF	FF	FF	FFFFFFF	80FF	0	0	0	10B0	5	54	C0	0X0000	0x23	0x0035	0x44	0xd0011	0x0000	0x0000
63	Dummy	00020000	FF	FB	FF	7F	FFFB7FF	80FF	0	0	0	0000	0	0	0	0X0000	0x23	0X0000	0X0	0xd007	0x0000	0x0000
64	"HX" Initialize Evacuation Pump	00020081	FF	FF	FF	FF	FFFFFFF	80FD	0	0	0	0000	0	0	0	0X0000	0x27	0x0039	0x44	0xd007	0x0000	0x0000
65	Place Roller on Tube (EP -45 Deg)	00000000	FF	FF	FF	7F	FFFFFF7F	880C	0	0	0	0000	0	0	80	0X0000	0x27	0x0035	0x44	0xd007	0x0000	0x0000
66	Dummy	00000000	FF	FF	FF	FE	FFFFFFFE	80FF	0	0	0	0000	0	0	0	0X0000	0x27	0X0000	0X0	0xd007	0x0000	0x0000
67	"AP" - Max Sample (BP -1.5 Sec)	02020061	FF	FF	FF	FF	FFFFFFF	80FF	0	0	0	0000	0	0	0	0X0000	0x28	0x0010	0x42	0xd0000	0x0000	0x0000
68	Delay Before Aspirate	00000000	FD	FF	FF	BF	FDFFFFBF	80FF	0	0	0	0000	0	0	0	0X0000	0x28	0X0011	0X42	0X0000	0x0000	0x0000
69	Aspirate to beginning of Flow Cell	00000284	FF	FF	FF	FE	FFFFFFFE	400C	0	0	0	0000	0	0	0	0X0000	0x28	0X0012	0x42	0xd0000	0x0000	0x0000
70	Activate SBV to fill flow cell while pulling EP during fast push of CP	00000010	FF	FD	5B	FFFD5B	4000	0	0	0	0000	0	0	0	0X0000	0x28	0X0013	0x42	0xd0000	0x0000	0x0000	
71	Activate SBV to fill flow cell while pulling EP during slow push of CP during analysis	00000000	FF	FF	FF	FF	FFFFFFF	400E	0	0	0	0000	0	0	0	0X0000	0x28	0x0000	0x00	0xd0101	0x0000	0x0000
72	Dummy	00000000	FF	FF	FF	FF	FFFFFFF	0	0	0	0	0000	0	0	0	0X0000	0x28	0X0000	0X0	0xd0101	0x0000	0x0000
73	"PT" Checking pressure	00000000	FF	FF	FF	FF	FFFFFFF	80FF	0	0	0	10B0	6	6C	C0	0X0000	0X00	0X002D	0X42	0xd0011	0x0101	75

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SPA State records

74	Recharge		00040000	FF	FF	FF	FFFFFFFF	80FF	0	0	0	10B0	5	6C	C0	0X0000	0X00	0X0000	0X0	0x0001	0x0000	0x0000
75	Delay before fill up the 42 inch tube		00000000	FF	FB	FF	FFBF8FFF	80FF	0	0	0	0000	0	0	C0	0X0000	0x00	0X2E	0X42	0x0001	0x0000	0x0000
76	Fill up pressure to 42 inch tube		00000080	FF	FF	FF	FFFFFFFF	80FF	0	0	0	0000	0	0	C0	0X0000	0x00	0XD02A	0X42	0x0001	0x0000	0x0000
77	Empty all pressure from air system		02020040	FF	FF	FF	FFFFFFFF	80FF	0	0	0	0000	0	0	C0	0X0000	0X00	0x000F	0x42	0x0001	0x0000	0x0000
78	Dummy		00000000	FD	FD	FF	FDFDFF3F	80FF	0	0	0	0000	0	0	C0	0X0000	0x00	0X0000	0X00	0x0007	0x0F0F	0x0054
79	Extra Dummy for PT to loop		00000000	FF	FF	FF	FFFFFFFF	80FF	0	0	0	0000	0	0	C0	0X0000	0x00	0X0000	0X00	0x0007	0x0000	0x0000
80	"B T" (Burp Test) Checking pressure		00000080	FF	FF	FF	FFFFFFFF	80FF	0	0	0	10B0	6	6F	C0	0X0000	0X00	0X0000	0X00	0x0001	0x0101	82
81	Recharge		00040000	FF	FF	FF	FFFFFFFF	80FF	0	0	0	10B0	5	6F	C0	0X0000	0X00	0X0000	0X00	0x0001	0x0000	0x0000
82	Air mixed (burp 1)		00000040	FF	FB	FF	FFBF87F	80FF	0	0	0	0000	0	0	C0	0X0000	0x00	0X0030	0X42	0x0001	0x0000	0x0000
83	Closed AMV		00000000	FF	FF	FF	FFFFFFFF	80FF	0	0	0	0000	0	0	C0	0X0000	0x00	0X0000	0X00	0x0001	0x0F0F	84
84	Spl air (burp 2)		00000040	FF	FF	FF	FFFFFFFF	80FF	0	0	0	0000	0	0	C0	0X0000	0x00	0X0031	0X42	0x0001	0x0000	0x0000
85	Checking pressure		00000080	FF	FF	FF	FFFFFFFF	80FF	0	0	0	10B0	6	6F	C0	0X0000	0x00	0X0000	0X0	0x0001	0x0000	87
86	Recharge		00040000	FF	FF	FF	FFFFFFFF	80FF	0	0	0	10B0	5	6F	C0	0X0000	0x00	0X0000	0X00	0x0001	0x0000	0x0000
87	Spl air (burp 3)		02000040	FF	FB	FF	FFBF87F	80FF	0	0	0	0000	0	0	C0	0X0000	0X00	0x0032	0x42	0x0001	0x0000	0x0000
88	Dummy		00000000	FD	FF	FF	FDF8FFBF	80FF	0	0	0	0000	0	0	C0	0X0000	0x00	0X0000	0X00	0x0007	0x0F0F	82
89	Extra Dummy for BT to loop		00000000	FF	FF	FF	FFFFFFFF	80FF	0	0	0	0000	0	0	C0	0X0000	0x00	0X0000	0X00	0x0007	0x0000	0x0000
90	PQ - Home Pipette Horizontal to bak sensor and EP pump		00020000	FF	FF	FF	FFFFFFFF	80FD	80FF	80FE	0	0000	0	0	FC	0X0000	0x12	0x0035	0x44	0x0007	0x0000	0x0000
91	Home Pipette vertical		00000000	FF	FF	FF	FFFFFFFF	0	80FE	80FF	0	0000	0	0	3C	0X0000	0x12	0x0035	0x44	0x0007	0x0000	0x0000
92	Home Pipette Horizontal to bak sensor		00000000	FF	FF	FF	FFFFFFFF	0	0	80FE	0	0000	0	0	0C	0X0000	0x12	0x0035	0x44	0x0007	0x0000	0x0000
93	Rotate out -3 deg to waste well		00000000	FF	FF	FF	FFFFFFFF	0	0	8440	0	0000	0	0	08	0X0000	0x12	0x0035	0x44	0x0007	0x0000	0x0000
94	Down to offset from vertical home		00000000	FF	FF	FF	FFFFFFFF	80FF	866F	0	0	0000	0	0	E0	0X0000	0x12	0x0035	0x44	0x0007	0x0000	0x0000
95	Rotate out to tube		00000000	FF	FF	FF	FFFFFFFF	0	0	EC41	0	0000	0	0	08	0X0000	0x12	0x0035	0x44	0x0007	0x0000	0x0000
96	Checking pressure		00000080	FF	FF	FF	FFFFFFFF	0	0	0	0	10B0	6	64	00	0X0000	0x12	0X0000	0X0	0x0001	0x0101	98
97	Recharge		00040000	FF	FF	FF	FFFFFFFF	0	0	0	0	10B0	5	64	00	0X0000	0x12	0x0038	0x44	0x0001	0x0000	0x0000
98	Dummy		00000000	FF	FB	FF	FFBF87F	80FF	0	0	0	0000	0	0	C0	0X0000	0x12	0X0000	0X0	0x0007	0x0000	0x0000
99	"P" - Start Pipette down to test tube Wait for previously started EP home (from HC) EP on tubing. Clean flowcell Wait for pipette down to complete, EP move		00020030	FF	FF	FF	FFFFFFFF	0	D543	0	0	0000	0	0	C0	0X0000	0x11	0x0035	0x44	0x0007	0x0000	0x0000
100			00000000	FF	FF	FF	FFFFFFFF	C44B	0	0	0	0000	0	0	A0	0X0000	0x11	0x0035	0x44	0x0007	0x0000	0x0000
101	Dummy		00000040	FF	FF	FF	FFFFFFFF	401A	0	0	0	0000	0	0	00	0X0000	0x11	0X0000	0X0	0x0007	0x0000	0x0000
102	"P2" (no Lamina fill) Start Lift Pipetter to 2/3		00020000	FF	FF	FF	FFFFFFFF	0	D566	0	0	0000	0	0	20	0X0000	0x15	0x003A	0x44	0x0007	0x0000	0x0000
103	Spl air		00000040	FF	FF	FF	FFFFFFFF	0	0	0	0	0000	0	0	0	0X0000	0x15	0X0032	0X42	0x0000	0x0000	0x0000
104	Pipette lift complete		00000000	FF	FF	FF	FFBF8BF	0	D571	0	0	0000	0	0	20	0X0000	0x15	0x0035	0x44	0x0007	0x0000	0x0000
105	Rotate In to Waste Well		00000000	FF	FF	FF	FFFFFFFF	0	0	EC42	0	0000	0	0	08	0X0000	0x15	0x0035	0x44	0x0007	0x0000	0x0000
106	Down to waste well / Rinse pump on		00010000	FF	FF	FF	FFFFFFFF	0	D547	0	0	0000	0	0	20	0X0000	0x15	0x0035	0x44	0x0007	0x0000	0x0000
107	Time delay for turn on Rinse pump if needed		00080000	FF	FF	FF	FFFFFFFF	0	0	0	0	0000	0	0	0	0X0000	0x15	0X0030	0X42	0x0007	0x0000	0x0000
108	Start lift pipette to top and delay		00000000	FF	F6	FF	FF8FFFF	0	D59E	0	0	0000	0	0	0	0X0000	0x15	0x002E	0x02	0x0000	0x0000	0x0000
109	Clear Pipetter until pipette lift complete		00000040	FF	FF	FF	FFFFFFFF	0	0	0	0	0000	0	0	20	0X0000	0x15	0x0035	0x44	0x0007	0x0000	0x0000
110	Delay to mimic timing of P4 (Lamina fill)		00080000	FF	FF	FF	FFBF8BF	0	0	0	0	0000	0	0	00	0X0000	0x15	0x0037	0x42	0x0000	0x0000	0x0000
111	Home Pipette vertical		00000000	FF	F7	FF	FF7FFFF	0	80FE	80FF	0	0000	0	0	3C	0X0000	0x15	0x0035	0x44	0x0007	0x0000	0x0000

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**IRIS Diagnostics
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8. Schematics

SPA State records

112	Home Pipette Horizontal to back sensor	00000000	FF	FF	FF	FF	FFFFFFF	0	0	80FE	0	0000	0	0	0C	0X0000	0X15	0x0395	0x44	0x0007	0x0000	0x0000
113	Rotate out -3 deg to waste well	00000000	FF	FF	FF	FF	FFFFFFF	0	0	8440	0	0000	0	0	08	0X0000	0X15	0x0395	0x44	0x0007	0x0000	0x0000
114	Down to offset from vertical home	00000000	FF	FF	FF	FF	FFFFFFF	0	866F	0	0	0000	0	0	20	0X0000	0X15	0x0395	0x44	0x0007	0x0000	0x0000
115	Checking pressure	00000080	FF	FD	FF	FF	FFFDFFF	0	0	0	0	1080	6	64	00	0X0000	0x23	0X0000	0X0	0x0001	0x0101	117
116	Recharge	00040000	FF	FF	FF	FF	FFFFFFF	0	0	0	0	1080	5	64	00	0X0000	0x23	0X0035	0X44	0x0001	0x0000	0x0000
117	Dummy	00020000	FF	FB	FF	FF	FFFBFFF	0	0	0	0	0000	0	0	00	0X0000	0X15	0X0000	0X0	0x0101	0x0000	0x0000
118	"P2" Delay during FBA rinse	00020000	FF	FF	FF	FF	FFFFFFF	80FF	0	0	0	0000	0	0	C0	0X0000	0x16	0x0393	0x42	0x0000	0x0000	0x0000
119	Pipette rotate out to tube	00000000	FF	FF	FF	FF	FFFFFFF	0	0	EC41	0	0000	0	0	08	0X0000	0X16	0X0035	0X44	0x0007	0x0000	0x0000
120	Dummy	00000000	FF	FF	FF	FF	FFFFFFF	80FD	0	0	0	0000	0	0	C0	0X0000	0X16	0X0000	0X0	0x0101	0x0000	0x0000
121	"P4" (P2 With Lamina fill) Start Lift Pipetter to 2/3	00020000	FF	FF	FF	FF	FFFFFFF	0	D566	0	0	0000	0	0	20	0X0000	0x15	0X003A	0X44	0x0007	0x0000	0x0000
122	Spit air	00000040	FF	FF	FF	FF	FFFFFFF	0	0	0	0	0000	0	0	0	0X0000	0x15	0X0032	0X42	0x0000	0x0000	0x0000
123	Pipette lift complete	00000000	FF	FF	FF	BF	FFFFFBF	0	D571	0	0	0000	0	0	20	0X0000	0x15	0X0035	0X44	0x0007	0x0000	0x0000
124	Rotate In to Waste Well	00000000	FF	FF	FF	FF	FFFFFFF	0	0	EC42	0	0000	0	0	08	0X0000	0x15	0X0035	0X44	0x0007	0x0000	0x0000
125	Down to waste well / Rinse pump on	00010000	FF	FF	FF	FF	FFFFFFF	0	D547	0	0	0000	0	0	20	0X0000	0x15	0X0035	0X44	0x0007	0x0000	0x0000
126	Time delay for turn on Rinse pump if needed	00080000	FF	FF	FF	FF	FFFFFFF	0	0	0	0	0000	0	0	0	0X0000	0x15	0X0030	0X42	0x0007	0x0000	0x0000
127	Start lift pipetter to top and delay	00000000	FF	F6	FF	FF	FFFBFFF	0	D56E	0	0	0000	0	0	0	0X0000	0x15	0x002E	0X02	0x0000	0x0000	0x0000
128	Clear Pipetter until pipette lift complete	00000040	FF	FF	FF	FF	FFFFFFF	0	0	0	0	0000	0	0	20	0X0000	0x15	0X0035	0X44	0x0007	0x0000	0x0000
129	Delay to allow additional Lamina fill	00080000	FF	FF	FF	BF	FFFFFBF	0	0	0	0	0000	0	0	00	0X0000	0X15	0x000F	0x42	0x0000	0x0000	0x0000
130	Home Pipette vertical	00000000	FF	F7	FF	FF	FFFFFFF	0	80FE	80FF	0	0000	0	0	3C	0X0000	0X15	0X0035	0X44	0x0007	0x0000	0x0000
131	Home Pipette Horizontal to back sensor	00000000	FF	FF	FF	FF	FFFFFFF	0	0	80FE	0	0000	0	0	0C	0X0000	0X15	0X0035	0X44	0x0007	0x0000	0x0000
132	Rotate out -3 deg to waste well	00000000	FF	FF	FF	FF	FFFFFFF	0	0	8440	0	0000	0	0	08	0X0000	0X15	0X0035	0X44	0x0007	0x0000	0x0000
133	Down to offset from vertical home	00000000	FF	FF	FF	FF	FFFFFFF	0	866F	0	0	0000	0	0	20	0X0000	0X15	0X0035	0X44	0x0007	0x0000	0x0000
134	Checking pressure	00000080	FF	FD	FF	FF	FFFDFFF	0	0	0	0	1080	6	64	00	0X0000	0x23	0X0000	0X0	0x0001	0x0101	136
135	Recharge	00040000	FF	FF	FF	FF	FFFFFFF	0	0	0	0	1080	5	64	00	0X0000	0x23	0X0035	0X44	0x0001	0x0000	0x0000
136	Dummy	00020000	FF	FB	FF	FF	FFFBFFF	0	0	0	0	0000	0	0	00	0X0000	0X15	0X0000	0X0	0x0101	0x0000	0x0000
137	"HC" - Start EP home / flowcell wash	00020030	FF	FF	FF	FF	FFFFFFF	0	0	0	0	0000	0	0	00	0X0000	0x35	0X0035	0X44	0x0101	0x0000	0x0000
138	Dummy	00000000	FF	FF	FF	FF	FFFFFFF	0	0	0	0	0000	0	0	00	0X0000	0x36	0X0000	0X0	0x0101	0x0000	0x0000
139	"LO" - Idle SPA condition	00020000	FF	FF	FF	FF	FFFFFFF	80FD	0	0	0	0000	0	0	0	0X0000	0x36	0X0038	0X44	0x0101	0x0000	0x0000
140	Dummy	00000000	FF	FD	FF	FF	FFFDFFF	0	0	0	0	0000	0	0	00	0X0000	0x36	0X0000	0X0	0x0101	0x0000	0x0000
141	"P5" Delay during FBA rinse for DL	00020000	FF	FF	FF	FF	FFFFFFF	80FF	0	0	0	0000	0	0	C0	0X0000	0x16	0x0396	0x42	0x0000	0x0000	0x0000
142	Pipette rotate out to tube	00000000	FF	FF	FF	FF	FFFFFFF	0	0	EC41	0	0000	0	0	08	0X0000	0X16	0X0035	0X44	0x0007	0x0000	0x0000
143	Dummy	00000000	FF	FF	FF	FF	FFFFFFF	80FD	0	0	0	0000	0	0	C0	0X0000	0X16	0X0000	0X0	0x0007	0x0000	0x0000

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IRIS Diagnostics
9172 Eton Ave
Chatsworth,
Ca 91311
Ph# 818-709-244

8. Schematics

FBA State records

State Order	State	On (Hex1)	Off (Hex1)	Off (Hex2)	Off (Hex3)	Off (Hex4)	Off (Hex)	CP	Dummy Motor	Dummy Motor	SP	Sensor Select	Sensor State	Sensor Mask	Motor Test	SM Test	ToSM	TValue	Tfune	End Ctrl	Brn Ctrl	Dest
0	IDLE	00000000	FF	FF	FF	FF	FFFFFFF	0	80FF	80FF	0	0000	0	0	0	0X0000	0xFF	0X0000	0X0	0x0007	0x0000	0x0000
1	"HC" INITIATE SP Home (Wait for SP home completion in SH)	00000020	FF	FF	FF	FF	FFFFFFF	80FF	80FF	80FF	0	0000	0	0	FC	0X0000	0x21	0x0010	0x44	0x0007	0x0000	0x0000
2	Dummy	00000000	FF	FF	FF	FF	FFFFFFF	80FF	80FF	80FF	0	0000	0	0	FC	0X0000	0x21	0X0000	0X0	0x0007	0x0000	0x0000
3	"PC" Prime Cannul and Sheath Pump	00000020	FF	FF	FF	FF	FFFFFFF	C54B	80FF	80FF	C44B	0000	0	0	BE	0X0000	0x23	0x001E	0x44	0x0007	0x0000	0x0000
4	Dummy	00000000	FF	FF	FF	FF	FFFFFFD	80FF	80FF	80FF	80FF	0000	0	0	FF	0X0000	0x23	0X0000	0X0	0x0007	0x0000	0x0000
5	"PL" Prime Lines	00000009	FF	FF	FF	FF	FFFFFFF	C C40	80FF	80FF	80FF	0000	0	0	BF	0X0000	0x24	0x001E	0x44	0x0007	0x0000	0x0000
6	Dummy	00000000	FF	FF	FF	FF	FFFFFFF	80FF	80FF	80FF	80FF	0000	0	0	FF	0X0000	0x24	0X0000	0X0	0x0007	0x0000	0x0000
7	Rinse Pipetter -- RP On Home CP pump	00000035	FF	FF	FF	FF	FFFFFFF	80FE	80FF	80FF	C949	0000	0	0	FE	0X0000	0x25	0x0010	0x44	0x0007	0x0000	0x0000
8	Dummy	00000000	FF	FF	FF	FF	FFFFFFC	80FF	80FF	80FF	80FF	0000	0	0	FF	0X0000	0x25	0X0000	0X0	0x0007	0x0000	0x0000
9	"PW" Prime Aspiration Line	00000015	FF	FF	FF	FF	FFFFFFF	80FF	80FF	80FF	CE4F	0000	0	0	FE	0X0000	0x26	0x001E	0x44	0x0007	0x0000	0x0000
10	Dummy	00000000	FF	FF	FF	FF	FFFFFFE	80FF	80FF	80FF	80FF	0000	0	0	FF	0X0000	0x26	0X0000	0X0	0x0007	0x0000	0x0000
11	"HP" Home CP and SP	00000020	FF	FF	FF	FF	FFFFFFF	80FE	80FF	80FF	80FE	0000	0	0	FF	0X0000	0x27	0x0010	0x44	0x0007	0x0000	0x0000
12	Dummy	00000000	FF	FF	FF	FF	FFFFFFD	80FF	80FF	80FF	80FF	0000	0	0	FF	0X0000	0x27	0X0000	0X0	0x0007	0x0000	0x0000
13	"RC" Delay before running CP fast push	00000000	FF	FF	FF	FF	FFFFFFF	80FF	80FF	80FF	80FF	0000	0	0	FF	0X0000	0x28	0x0015	0x42	0x0000	0x0000	0x0000
14	Fast push	00000000	FF	FF	FF	FF	FFFFFFF	4001	80FF	80FF	80FF	0000	0	0	3F	0X0000	0x28	0x0016	0x42	0x0000	0x0000	0x0000
15	Slow CP push during analysis	00000000	FF	FF	FF	FF	FFFFFFF	4002	80FF	80FF	80FF	0000	0	0	3F	0X0000	0x28	0X0000	0X0	0x0007	0x0000	0x0000
16	Dummy	00000000	FF	FF	FF	FF	FFFFFFF	0	80FF	80FF	80FF	0000	0	0	3F	0X0000	0x28	0X0000	0x0	0x0000	0x0000	0x0000
17	"DB" Place SP roller on hose with 45 deg move Debubble	00000039	FF	FF	FF	FF	FFFFFFF	80FF	80FF	80FF	8601	0000	0	0	FE	0X0000	0x29	0x001C	0x44	0x0007	0x0000	0x0000
18	Dummy	00000000	FF	FF	FF	FF	FFFFFFC	80FF	80FF	80FF	80FF	0000	0	0	FF	0X0000	0x29	0X0000	0X0	0x0007	0x0000	0x0000
19	"DE" Debubble (SP 10 Rev.)	00000039	FF	FF	FF	FF	FFFFFFF	80FF	80FF	80FF	D051	0000	0	0	FE	0X0000	0x30	0x001E	0x44	0x0007	0x0000	0x0000
20	Dummy	00000000	FF	FF	FF	FF	FFFFFFC	80FF	80FF	80FF	80FF	0000	0	0	FF	0X0000	0x30	0X0000	0X0	0x0007	0x0000	0x0000
21	Begin ZZ	00000000	FF	FF	FF	FF	FFFFFFF	0	80FF	80FF	0	0000	0	0	0	0X0000	0xFF	0X0000	0X0	0x0000	0x0080	0x0000
22	End ZZ	00000000	FF	FF	FF	FF	FFFFFFF	0	80FF	80FF	0	0000	0	0	0	0X0000	0xFF	0X0000	0X0	0x0000	0x0000	0x0000
23	"IC" Home CP	00000020	FF	FF	FF	FF	FFFFFFF	80FE	80FF	80FF	80FF	0000	0	0	FF	0X0000	0x31	0x0010	0x44	0x0007	0x0000	0x0000
24	Place Roller on Tube (CP 46 Deg)	00000000	FF	FF	FF	FF	FFFFFFF	8601	80FF	80FF	80FF	0000	0	0	BF	0X0000	0x31	0x001C	0x44	0x0007	0x0000	0x0000
25	Clean Drain	00000009	FF	FF	FF	FF	FFFFFFD	D263	80FF	80FF	80FF	0000	0	0	BF	0X0000	0x31	0x001E	0x44	0x0007	0x0000	0x0000
26	Dummy	00000000	FF	FF	FF	FF	FFFFFFF	80FF	80FF	80FF	80FF	0000	0	0	FF	0X0000	0x31	0X0000	0X0	0x0007	0x0000	0x0000
27	"RV" ResetValves to OR(Used instead of "RE" during "BD" in Hypertermal)	00000000	FF	FF	FF	FF	FFFFFFF	80FF	80FF	80FF	80FF	0000	0	0	FF	0X0000	0x31	0X0000	0X0	0x0007	0x0000	0x0000
28	Dummy	00000000	FF	FF	FF	FF	FFFFFFF	80FF	80FF	80FF	80FF	0000	0	0	FF	0X0000	0x30	0X0000	0X0	0x0007	0x0000	0x0000
29	"HS" home position for CP and SP	00000020	FF	FF	FF	FF	FFFFFFF	80FE	80FF	80FF	80FE	0000	0	0	FF	0X0000	0x21	0x001C	0x44	0x0007	0x0000	0x0000
30	Dummy	00000000	FF	FF	FF	FF	FFFFFFD	80FF	80FF	80FF	80FF	0000	0	0	FF	0X0000	0x21	0X0000	0X0	0x0007	0x0000	0x0000
31	"EB" End constant velocity SP move	00000000	FF	FF	FF	FF	FFFFFFF	80FF	80FF	80FF	80FF	0000	0	0	FF	0X0000	0x34	0x001C	0x44	0x0007	0x0000	0x0000
32	Dummy	00000000	FF	FF	FF	FF	FFFFFFF	80FF	80FF	80FF	80FF	0000	0	0	FF	0X0000	0x34	0X0000	0X0	0x0007	0x0000	0x0000
33	"SH" rotate CP 46 degree Wait for previously started SP home (from HC)	00000020	FF	FF	FF	FF	FFFFFFF	8001	80FF	80FF	0	0000	0	0	BF	0X0000	0x34	0x001C	0x44	0x0007	0x0000	0x0000
34	Dummy	00000000	FF	FF	FF	FF	FFFFFFF	80FF	80FF	80FF	80FF	0000	0	0	FF	0X0000	0x34	0X0000	0X0	0x0007	0x0000	0x0000

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IRIS Diagnostics
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8. Schematics

FBA State records

35	"RF" Delay before running CP fast push	00000000	FF	FF	FF	FF	FF	FF	FF	FF	FF	0	0	FF	0X0000	0X35	0X001A	0x42	0x0000	0x0000	0x0000
36	Fast push	00000000	FF	FF	FF	FF	FF	FF	FF	FF	FF	0	0	3F	0X0000	0X35	0x001B	0x42	0x0000	0x0000	0x0000
37	Slow CP push during analysis	00000000	FF	FF	FF	FF	FF	FF	FF	FF	FF	0	0	3F	0X0000	0X35	0X0000	0X0	0X0007	0x0000	0x0000
38	Dummy	00000000	FF	FF	FF	FF	FF	FF	FF	FF	FF	0	0	3F	0X0000	0X35	0X0000	0x0	0x0000	0x0000	0x0000
39	"AC" Home and initialize CP and home SP	00000030	FF	FF	FF	FF	FF	FF	FF	FF	FF	0	0	FF	0X0000	0x21	0x001D	0x44	0x0007	0x0000	0x0000
40	Place Roller on Tube (CP and SP 45 Deg)	00000000	FF	FF	FF	FF	FF	FF	FF	FF	FF	0	0	BE	0X0000	0x21	0x001C	0x44	0x0007	0x0000	0x0000
41	Dummy	00000000	FF	FF	FF	FF	FF	FF	FF	FF	FF	0	0	FF	0X0000	0X21	0X0000	0X0	0x0007	0x0000	0x0000
42	"RD" Rinse Pipetter and Debubble Home CP pump	00000034	FF	FF	FF	FF	FF	FF	FF	FF	FF	0	0	FE	0X0000	0x36	0x001D	0x44	0x0007	0x0000	0x0000
43	Place SP roller on hose with 45 deg move Debubble	00000008	FF	FF	FF	FF	FF	FF	FF	FF	FF	0	0	FC	0X0000	0x36	0X0007	0X42	0x0007	0x0000	0x0000
44	Dummy	00000000	FF	FF	FF	FF	FF	FF	FF	FF	FF	0	0	FF	0X0000	0x36	0X0000	0X0	0x0007	0x0000	0x0000

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IRIS Diagnostics
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8. Schematics

STM State records

State Index	State Description	Dor	Dand	SM	CM	CI	CO	RC	SenSel	Stst	Smsk	Mtst	SMtst	ToSM	Tval	Tfnc	EndCtl	BmCtl	Dest
0	Reset in general	0x00000000	0xFFFFFFFFFF	0x80FF	0x80FF	0x80FF	0x80FF	0x0000	0x0000	0x00	0x00	0x00	0x0000	0xFF	0x0000	0x00	0x0000	0x0000	0x0000
1	Start ER; Move rack to output conveyor and move input conveyor out a bit	0x00000000	0xFFFFFFFFFF	0x8241	0x0000	0x80FF	0x80FF	0x0000	0x0000	0x00	0x00	0xFF	0x0000	0x33	0x0000	0x00	0x0007	0x0000	0x0000
2	Fall through to M1	0x00000000	0xFFFFFFFFFF	0x8204	0x0000	0x80FF	0x80FF	0x0000	0x0000	0x00	0x00	0xFF	0x0000	0x33	0x0000	0x00	0x0007	0x0000	0x0000
3	Start M1; Start HC	0x00000000	0xFFFFFFFFFF	0x80FD	0x80FE	0x80FF	0x0B00	0x0000	0x0000	0x00	0x00	0xFF	0x0000	0x01	0x0000	0x00	0x0007	0x0000	0x0000
4	End HC	0x00000000	0xFFFFFFFFFF	0x80FF	0x80FF	0x80FF	0x80FF	0x0000	0x0000	0x00	0x00	0xFF	0x0000	0x01	0x0000	0x00	0x0007	0x0000	0x0000
5	Start US; Branch if upstream not ready	0x00000000	0xFFFFFFFFFF	0x0000	0x0000	0x0B00	0x0000	0x0000	0x0030	0x04	0x04	0xFF	0x0000	0x01	0x0099	0x02	0x0000	0x0101	11
6	Branch if buffer full	0x00000000	0xFFFFFFFFFF	0x0000	0x0000	0x0000	0x0000	0x0000	0x0230	0x00	0x04	0xFF	0x0000	0x01	0x0000	0x00	0x0001	0x0101	11
7	Signal OK to send rack; Wait for complete signal (ready)	0x00000010	0xFFFFFFFFFF	0x0000	0x0000	0x80FF	0x0000	0x0000	0x0030	0x00	0x04	0xFF	0x0000	0x01	0x0000	0x00	0x0001	0x0000	0x0000
8	Delay 200 ms	0x00000000	0xFFFFFFFFFF	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x00	0x00	0xFF	0x0000	0x01	0x0014	0x02	0x0000	0x0000	0x0000
9	Unsignal OK to send rack; feed in 3.5 sec	0x00000000	0xFFFFFFFFFF	0x0000	0x0000	0x0B00	0x0000	0x0000	0x0000	0x00	0x00	0xFF	0x0000	0x01	0x010F	0x02	0x0000	0x0000	0x0000
10	End US	0x00000000	0xFFFFFFFFFF	0x0000	0x0000	0x80FF	0x0000	0x0000	0x0000	0x00	0x00	0xFF	0x0000	0x01	0x0000	0x00	0x0007	0x0000	0x0000
11	Run rack output	0x00000000	0xFFFFFFFFFF	0x80FF	0x0000	0x0000	0x0B00	0x0000	0x0000	0x00	0x0F	0x00	0x0000	0x01	0x00E6	0x02	0x0007	0x0000	0x0000
12	Check for room at output side	0x00000000	0xFFFFFFFFFF	0x80FF	0x80FF	0x80FF	0x0000	0x0000	0x0230	0x01	0x01	0xFF	0x0000	0x01	0x0000	0x00	0x0006	0x0101	14
13	Branch to no rack	0x00000000	0xFFFFFFFFFF	0x0000	0x0000	0x0000	0x0000	0x0000	0x0030	0x02	0x02	0x00	0x0000	0x01	0x0000	0x00	0x0001	0x0101	20
14	Run Rack in	0x00000000	0xFFFFFFFFFF	0x80FF	0x0000	0x0B00	0x0B00	0x0000	0x0040	0x1F	0x1F	0x00	0x0000	0x01	0x0480	0x03	0x0007	0x0000	20
15	Extra time to make flush. Read rack ID for transmission.	0x00000000	0xFFFFFFFFFF	0x80FF	0x0000	0x0B00	0x0B00	0x0000	0x0040	0x00	0x1F	0x00	0x0000	0x01	0x00E0	0x02	0x0006	0x0000	0x0000
16	Stop Conveyor; Retract output carrier arm	0x00000000	0xFFFFFFFFFF	0x80FF	0x80FE	0x80FF	0x80FF	0x0000	0x0000	0x00	0x00	0xFF	0x0000	0x01	0x0000	0x00	0x0007	0x0000	0x0000
17	Wait for room at output side	0x00000000	0xFFFFFFFFFF	0x80FF	0x80FF	0x80FF	0x0000	0x0000	0x0230	0x01	0x01	0xFF	0x0000	0x01	0x0000	0x00	0x0006	0x0101	19
18	Loop if DS not ready	0x00000000	0xFFFFFFFFFF	0x0000	0x0000	0x0000	0x0000	0x0000	0x0030	0x02	0x02	0x00	0x0000	0x01	0x0000	0x00	0x0001	0x0101	17
19	Move Rack in	0x00000000	0xFFFFFFFFFF	0x8240	0x0000	0x80FF	0x0B00	0x0000	0x0000	0x00	0x00	0xFF	0x0000	0x01	0x0000	0x00	0x0000	0x0007	0x4D58
20	No Rack Wait for "Go Next" from master	0x00000000	0xFFFFFFFFFF	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x00	0x00	0xFF	0x0000	0x39	0x0000	0x00	0x0000	0x0000	0x0000
21	End M1; End ER	0x00000000	0xFFFFFFFFFF	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x00	0x00	0xFF	0x0000	0x39	0x0000	0x00	0x0000	0x0000	0x0000
22	Start MN; Branch if upstream not ready	0x00000000	0xFFFFFFFFFF	0x0000	0x0000	0x0000	0x0000	0x0000	0x0030	0x04	0x04	0xFF	0x0000	0x32	0x0002	0x02	0x0000	0x0101	27
23	Branch if buffer full	0x00000000	0xFFFFFFFFFF	0x0000	0x0000	0x80FF	0x80FF	0x0000	0x0230	0x00	0x04	0xFF	0x0000	0x32	0x0000	0x00	0x0001	0x0101	27
24	Signal OK to send rack; Wait for complete signal (ready)	0x00000010	0xFFFFFFFFFF	0x0000	0x0000	0x80FF	0x80FF	0x0000	0x0030	0x00	0x04	0xFF	0x0000	0x32	0x0000	0x00	0x0001	0x0000	0x0000
25	Delay 200 ms	0x00000000	0xFFFFFFFFFF	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x00	0x00	0xFF	0x0000	0x32	0x0014	0x02	0x0000	0x0000	0x0000
26	Unsignal OK to send rack	0x00000000	0xFFFFFFFFFF	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x00	0x00	0xFF	0x0000	0x32	0x0002	0x02	0x0000	0x0000	0x0000

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8. Schematics

STM State records

27	Delay to allow SPA to lift pippette clear (in TW)	0x00000000	0xFFFFFFFF	0X0000	0X0000	0X0B00	0x0000	0X0000	0X00	0XFF	0X0000	0x32	0x0007	0x42	0x0000	0x0000	0x0000
28	Is Rack present at output sensor? skip if none(Start DS)	0x00000000	0xFFFFFFFF	0X0000	0X0000	0X80FF	0X0000	0X0000	0x02	0x00	0X0000	0x01	0x0000	0x00	0x0001	0x0101	33
29	Assert "Rack Ready"	0x00000008	0xFFFFFFFF	0X0000	0X0000	0X0B00	0X0000	0X0000	0X00	0X00	0X0000	0x01	0x0020	0x02	0x0007	0x0000	0X0000
30	Check for "send it"	0x00000000	0xFFFFFFFF	0X0000	0X0000	0X0000	0X0000	0X0000	0x02	0x00	0X0000	0x01	0x0040	0x03	0x0001	0x0000	33
31	Move Rack Downstream	0x00000000	0xFFFFFFFF	0X0000	0X8043	0X80FF	0X0000	0X0000	0X00	0XFF	0X0000	0x01	0x0000	0x00	0x0007	0x0000	0X0000
32	Unsignal Ready	0x00000000	0xFFFFFFFF7	0X0000	0X80FE	0X80FF	0X0000	0X0000	0X00	0XFF	0X0000	0x01	0X0000	0X00	0X0007	0X0000	0X0000
33	End DS	0x00000000	0xFFFFFFFF	0X0000	0X0000	0X0000	0X0000	0X0000	0X00	0XFF	0X0000	0x01	0X0000	0X00	0X0007	0X0000	0X0000
34	Start MX; (Entry point from M1)																
	Start moving to next tube position, scan barcode along the way	0x00000000	0xFFFFFFFF	0x8300	0X0000	0X0000	0x0000	0X0000	0X1F	0XFF	0X0000	0x31	0X0000	0X00	0x8303	0x0000	0x0000
35	Get tube number if greater than 10, eject rack	0x00000000	0xFFFFFFFF	0x80FF	0X0000	0X0000	0X0000	0X0000	0X1F	0X00	0X0000	0x31	0X0000	0X00	0x0001	0x0101	0x4552
36	Stabilize before reading tube detector	0x00000000	0xFFFFFFFF	0X0000	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X0000	0x31	0x0002	0x02	0x0007	0x0000	0x0000
37	Store tube detector value	0x00000000	0xFFFFFFFF	0X0000	0X0000	0X0000	0X0000	0X0000	0x05	0X00	0X0000	0x31	0x0000	0x00	0x0202	0x0000	0x0000
38	End MN, MX; Send completion to MC	0x00000000	0xFFFFFFFF	0X0000	0X0000	0X0000	0X0000	0X0000	0X00	0XFF	0X0000	0x31	0X0000	0X00	0x0007	0x0000	0x0000
39	Begin BC	0x00000000	0xFFFFFFFF	0X0000	0X0000	0X0000	0X0000	0X0000	0X00	0X1F	0X0000	0	0X0000	0X00	0x0007	0x0000	0x0000
40		0x00000000	0xFFFFFFFF	0X0000	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X0000	0x44	0x0009	0x02	0x0000	0x0000	0x0000
41	End BC	0x00000000	0xFFFFFFFF	0X0000	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X0000	0	0X0000	0X00	0x0007	0x0000	0x0000
42	Begin CR; run infeed conveyor in reverse	0x00000000	0xFFFFFFFF	0X80FF	0X0000	0X0100	0X0000	0X0000	0X00	0x00	0X0000	0x30	0X0016	0X02	0x0007	0x0000	0x0000
43	Home sample carrier while discharge runs	0x00000000	0xFFFFFFFF	0X80FD	0X80FE	0X0B00	0x0000	0X0000	0X00	0xFF	0X0000	0	0x0000	0x00	0x0007	0x0000	0x0000
44	Move Sample Lever to eject position	0x00000000	0xFFFFFFFF	0X8244	0X0000	0X80FF	0X0000	0X0000	0X00	0xFF	0X0000	0	0x0000	0x00	0x0007	0x0000	0x0000
45	Home Sample Lever	0x00000000	0xFFFFFFFF	0X80FD	0X0000	0X80FF	0x0000	0X0000	0X00	0xFF	0X0000	0	0x0000	0x00	0x0007	0x0000	0x0000
46	Run carrier output buffer motor until sensor not blocked or until time out	0x00000000	0xFFFFFFFF	0X80FF	0X0000	0X0000	0X0000	0X80FF	0X00	0x01	0x0000	0	0x0133	0x02	0x0001	0x0000	0x0000
47	Run CO a little longer	0x00000000	0xFFFFFFFF	0X80FF	0X0000	0X0000	0x0000	0X80FF	0X00	0x00	0X0000	0	0x0040	0x02	0x0000	0x0007	0x4453
48	End CR	0x00000000	0xFFFFFFFF	0X80FF	0X0000	0X80FF	0x0000	0X80FF	0X00	0x00	0X0000	0X33	0X0000	0X00	0x0101	0x0000	0x0000
49	Begin WVR - Test for rack present Branch if no rack	0x00000000	0xFFFFFFFF	0X0000	0X0000	0X0000	0x0000	0X0000	0X04	0X04	0X0000	0x02	0X0000	0X00	0X0001	0x0101	52
50	Signal rack present - hang until acknowledged by MC (GoNext)	0X00000000	0xFFFFFFFF	0X0000	0X0000	0X0000	0x0000	0X0000	0X00	0XFF	0X0000	0X52	0x0000	0x00	0X0000	0X0000	0X0000
51	Branch unconditionally to EndWR	0x00000000	0xFFFFFFFF	0X0000	0X0000	0X0000	0X0000	0X0000	0X00	0XFF	0X0000	0x02	0x0000	0x00	0X0000	0x0101	57

Diagram
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STM State records

52	Is Rack present at output sensor? skip if none(Start DS)	0x00000000	0xFFFFFFFF	0X0000	0X0000	0X80FF	0X80FF	0X0000	0X0230	0x02	0x02	0x00	0X0000	0x02	0x0000	0x00	0x0001	0x0101	57
53	Assert "Rack Ready"	0x00000008	0xFFFFFFFF	0X0000	0X0000	0X0B00	0X0B00	0X0000	0X0000	0X00	0X00	0X00	0X0000	0x02	0x0020	0x02	0x0007	0x0000	57
54	Check for "send it"	0x00000000	0xFFFFFFFF	0X0000	0X0000	0X0000	0X0000	0X0000	0x0030	0x02	0x02	0X00	0X0000	0x02	0x0040	0x03	0x0001	0x0000	
55	Move Rack Downstream	0x00000000	0xFFFFFFFF	0X0000	0X8043	0X0000	0X80FF	0X0000	0X0000	0X00	0X00	0XFF	0X0000	0x02	0x0000	0x00	0x0007	0x0000	57
56	Unsignal Ready	0x00000000	0xFFFFFFFF	0X0000	0X80FE	0X80FF	0X80FF	0X0000	0X0000	0X00	0X00	0XFF	0X0000	0x02	0X0000	0X00	0X0007	0X0000	
57	End WR	0x00000000	0xFFFFFFFF	0X0000	0X0000	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0XFF	0X0000	0x02	0X0000	0X00	0X0000	0X0000	57
58	Begin ZZ	0x00000000	0xFFFFFFFF	0X0000	0X0000	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X0000	0x02	0X0000	0X00	0X0000	0X0000	
59	End ZZ	0x00000000	0xFFFFFFFF	0X0000	0X0000	0X0000	0X0000	0X0000	0X0000	0X00	0X00	0X00	0X0000	0xFF	0X0000	0X00	0X0000	0x0080	57
60	Start M2 (Home)	0x00000000	0xFFFFFFFF	0X80FD	0X80FE	0X80FF	0X80FF	0X0000	0X0000	0X00	0X00	0XFF	0X0000	0xFF	0X0000	0X00	0X0000	0X0000	
61	Convey Rack in	0x00000000	0xFFFFFFFF	0X80FF	0X80FF	0X0B00	0X0B00	0X0000	0X0040	0X1F	0X1F	0X00	0X0000	0	0X0481	0x03	0x0007	0x0000	85
62	More Time to square it	0x00000000	0xFFFFFFFF	0X80FF	0X80FF	0X0B00	0X0B00	0X0000	0X0000	0X00	0X00	0X00	0X0000	0	0x00A0	0x02	0x0007	0x0000	
63	Check if Output clear	0x00000000	0xFFFFFFFF	0X80FF	0X80FF	0X80FF	0X80FF	0X0000	0X0230	0X01	0X01	0X00	0X0000	0	0x0009	0x02	0x0000	0x0001	85
64	Move Rack in	0x00000000	0xFFFFFFFF	0x8240	0X80FF	0X80FF	0X80FF	0X0000	0X0000	0X00	0X00	0XFF	0X0000	0	0X0000	0X00	0x0007	0x0000	
65	Notify MC	0x00000000	0xFFFFFFFF	0X80FF	0X80FF	0X80FF	0X80FF	0X0000	0X0000	0X00	0X00	0XFF	0X0000	0X31	0X0000	0X00	0x0007	0x0000	57
66		0x00000000	0xFFFFFFFF	0X80FF	0X80FF	0X80FF	0X80FF	0X0000	0X0000	0X00	0X00	0X00	0X0000	0	0X0010	0x02	0x0007	0x0000	
67	Move to Next tube	0x00000000	0xFFFFFFFF	0x8300	0X80FF	0X80FF	0X80FF	0X0000	0X4000	0X00	0X1F	0XFF	0X0000	0x32	0X0000	0X00	0x8303	0x0000	57
68	Move to Next tube	0x00000000	0xFFFFFFFF	0x8300	0X80FF	0X80FF	0X80FF	0X0000	0X4000	0X00	0x1F	0XFF	0X0000	0x32	0X0000	0X00	0x8303	0x0000	
69	Move to Next tube	0x00000000	0xFFFFFFFF	0x8300	0X80FF	0X80FF	0X80FF	0X0000	0X4000	0X00	0X1F	0XFF	0X0000	0x32	0X0000	0X00	0x8303	0x0000	57
70	Move to Next tube	0x00000000	0xFFFFFFFF	0x8300	0X80FF	0X80FF	0X80FF	0X0000	0X4000	0X00	0X1F	0XFF	0X0000	0x32	0X0000	0X00	0x8303	0x0000	
71	Move to Next tube	0x00000000	0xFFFFFFFF	0x8300	0X80FF	0X80FF	0X80FF	0X0000	0X4000	0X00	0X1F	0XFF	0X0000	0x32	0X0000	0X00	0x8303	0x0000	57
72	Move to Next tube	0x00000000	0xFFFFFFFF	0x8300	0X80FF	0X80FF	0X80FF	0X0000	0X4000	0X00	0X1F	0XFF	0X0000	0x32	0X0000	0X00	0x8303	0x0000	
73	Move to Next tube	0x00000000	0xFFFFFFFF	0x8300	0X80FF	0X80FF	0X80FF	0X0000	0X4000	0X00	0X1F	0XFF	0X0000	0x32	0X0000	0X00	0x8303	0x0000	57
74	Move to Next tube	0x00000000	0xFFFFFFFF	0x8300	0X80FF	0X80FF	0X80FF	0X0000	0X4000	0X00	0X1F	0XFF	0X0000	0x32	0X0000	0X00	0x8303	0x0000	
75	Move to Next tube	0x00000000	0xFFFFFFFF	0x8300	0X80FF	0X80FF	0X80FF	0X0000	0X4000	0X00	0X1F	0XFF	0X0000	0x32	0X0000	0X00	0x8303	0x0000	57
76	Move to Next tube	0x00000000	0xFFFFFFFF	0x8300	0X80FF	0X80FF	0X80FF	0X0000	0X4000	0X00	0X1F	0XFF	0X0000	0x32	0X0000	0X00	0x8303	0x0000	
77	Move once more	0x00000000	0xFFFFFFFF	0x8300	0X80FF	0X80FF	0X80FF	0X0000	0X0000	0X00	0X00	0XFF	0X0000	0	0X0000	0X00	0x0007	0x0000	57
78	Move Rack to output	0x00000000	0xFFFFFFFF	0x8241	0X80FF	0X80FF	0X80FF	0X0000	0X0000	0X00	0X00	0XFF	0X0000	0	0X0000	0X00	0x0007	0x0000	
79	Retract Pusher	0x00000000	0xFFFFFFFF	0x8204	0X80FF	0X80FF	0X80FF	0X0000	0X0000	0X00	0X00	0XFF	0X0000	0	0X0000	0X00	0x0007	0x0000	85
80	Run Output conv.	0x00000000	0xFFFFFFFF	0X80FF	0X80FF	0X0B00	0X0B00	0X0000	0X0230	0X02	0X02	0X00	0X0000	0	0x0481	0x03	0x0007	0x0000	
81	More Time to square it	0x00000000	0xFFFFFFFF	0X80FF	0X80FF	0X80FF	0X80FF	0X0000	0X0000	0X00	0X00	0X00	0X0000	0	0x0080	0x02	0x0007	0x0000	60
82	Do Next Rack	0x00000000	0xFFFFFFFF	0X80FF	0X80FF	0X80FF	0X80FF	0X0000	0X0000	0X00	0X00	0X00	0X0000	0x33	0x0009	0x02	0x0000	0x0101	
83	Recycle rack to input	0x00000000	0xFFFFFFFF	0x80FF	0X8003	0X80FF	0X80FF	0X0000	0X0000	0X00	0X00	0XFF	0X0000	0	0X0200	0X03	0x0007	0x0000	85
84	Do Next Rack	0x00000000	0xFFFFFFFF	0X80FF	0X80FF	0X80FF	0X80FF	0X0000	0X0000	0X00	0X00	0X00	0X0000	0X33	0X0000	0X00	0x0000	0x0101	
85	No Rack	0x00000000	0xFFFFFFFF	0X80FF	0X80FF	0X80FF	0X80FF	0X0000	0X0000	0X00	0X00	0X00	0X0000	0X38	0X0000	0X00	0x0101	0x0000	57
86	End M2	0x00000000	0xFFFFFFFF	0X80FF	0X80FF	0X80FF	0X80FF	0X0000	0X0000	0X00	0X00	0X00	0X0000	0	0X0000	0X00	0x0000	0x0101	

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9

Preventive Maintenance

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9. Preventive Maintenance

iQ[®] 200 Preventive Maintenance Procedure.

This document describes Iris Diagnostics' Preventive Maintenance procedures for the iQ[®] 200.

There are two (2) classes of preventive maintenance: namely the Semi-Annual Preventive Maintenance and the Annual Certification.

The Semi-Annual Preventive Maintenance should be performed six (6) months after the installation date or six (6) months after the last Annual Certification regardless of the number of samples the instrument has processed. The Annual Certification should be performed six (6) months from the last Semi-Annual Preventive Maintenance regardless of the number of samples it has processed.

This procedure is written for both Semi-Annual Preventive Maintenance and Annual Certification. Procedures pertaining only to the Annual Certification are written in *Italic* characters.

This procedure must be used in combination with the International Preventive Maintenance Checklist F-19-0044-rev B for Distribution Partners, or F-19-0043 iQ200 Preventive Maintenance Checklist or F-19-0042 iQ200 Annual Certification Checklist for Domestic FSE's. All activities must be recorded on the appropriate checklist.

Material required

Part Number 799-3059 iQ200 Sprint Preventive Maintenance Kit

Or

Part Number 799-3058 iQ200 Sprint Annual Certification Kit



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9. Preventive Maintenance

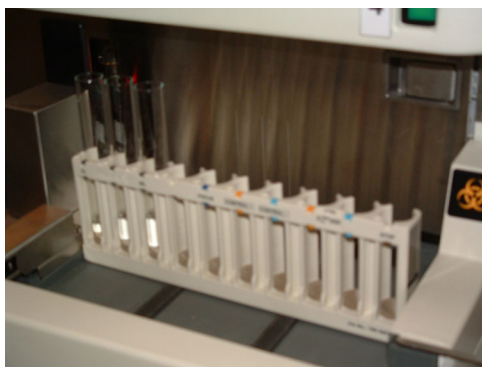
Surface clean-up

1. Clean all instrument external surfaces. Special care must be given to the STM module. For the clean-up, use Iris System Cleanser diluted to 1:10 and lint free paper towels, use protective gloves.



Fluidic system flush

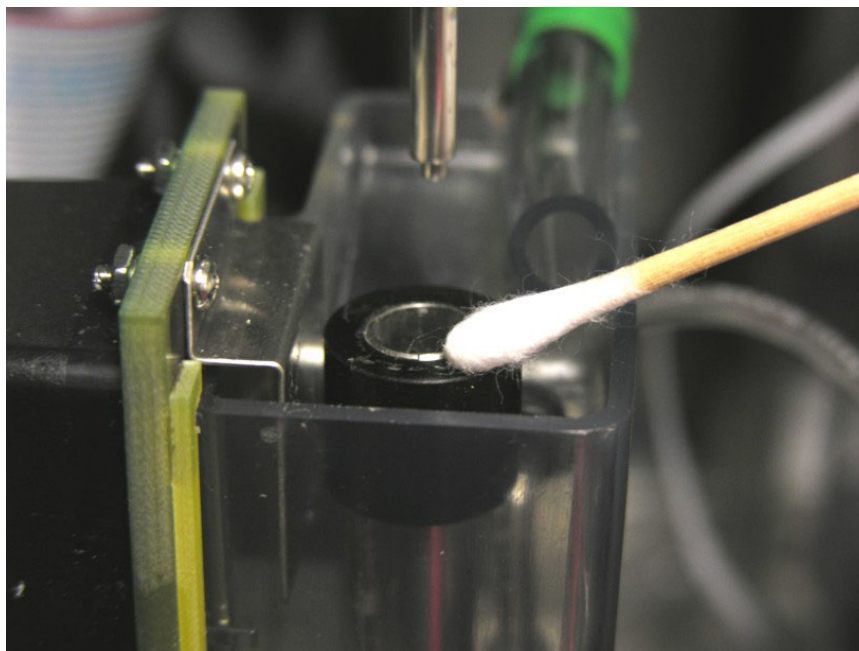
1. Prepare a CONTROL rack with Iris System Cleanser solution in position 1 and two (2) tubes of Iris Diluent in positions 2 and 3.
2. Run this rack three (3) times.



9. Preventive Maintenance

Rinse/Waste Well Clean Up

1. Clean the surfaces of the Rinse/Waste Well Assembly with 1:10 diluted Iris System Cleanser.



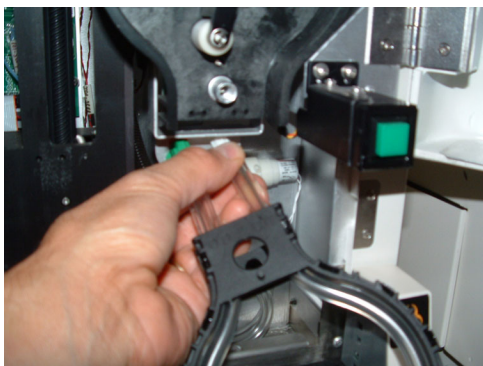
2. Turn-off the instrument and remove the front panel and the top panels.

9. Preventive Maintenance

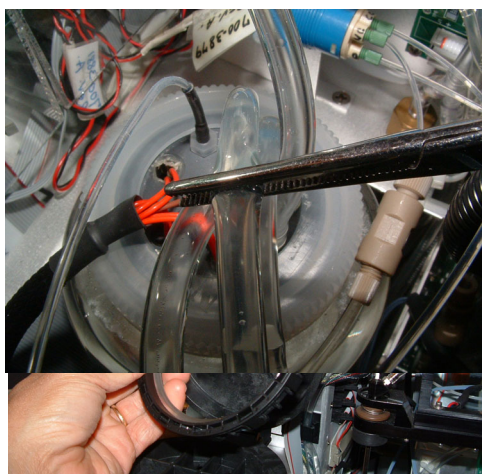
Fluidic system components replacement

Peristaltic pump cassettes replacement

1. Remove and replace the cassette on the Cannula Pump (PN#700-3823). Pull the tube ends to release the cassette tubing.

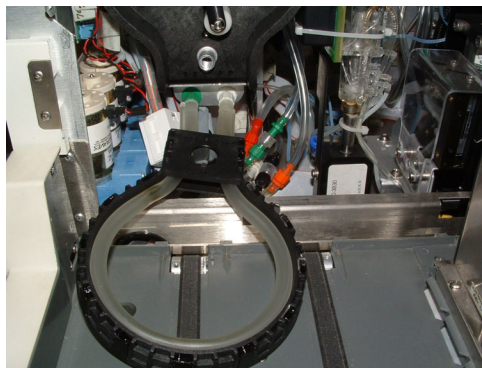


2. Remove and replace the cassette on the Evacuation Pump (PN#700-3822). Unscrew the connectors to release the cassette tubing.
3. Clamp the tube between the Lamina Bottle and the Lamina Pump (green connector line) with a hemostat.

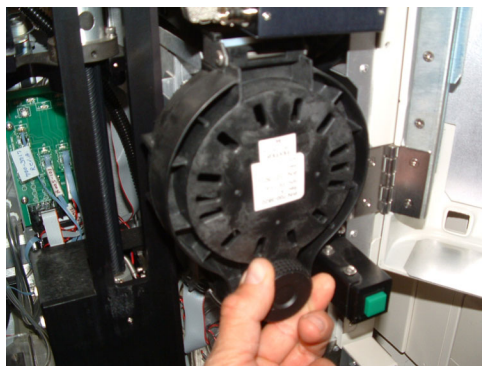


9. Preventive Maintenance

4. Remove and replace the cassette on the Lamina Pump (PN#700-3822). Unscrew the connectors to release the cassette tubing. Once the new cassette has been secured, remove the hemostat.



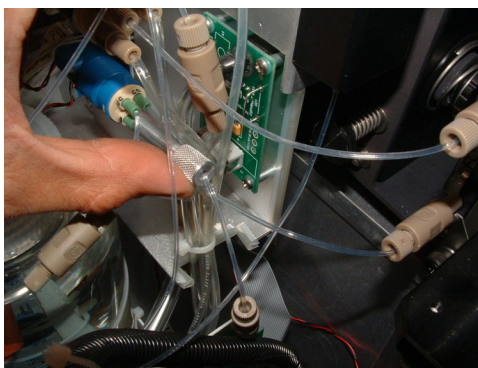
5. Verify that all the peristaltic pump doors are closed properly.



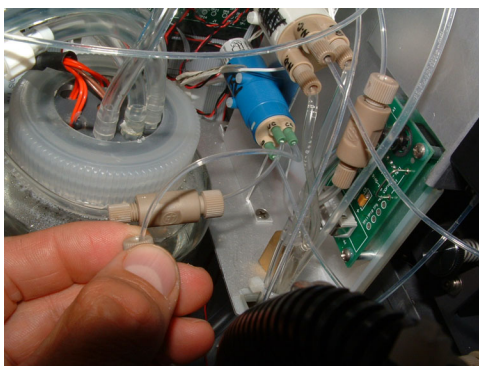
9. Preventive Maintenance

Tubing replacement

1. Replace the Tubing fitting assembly (PN#700-3855) between the EBV N.O. Port and the Flow Cell drain.

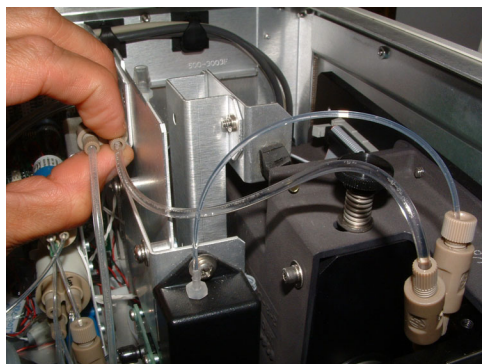


2. Replace the Tubing fitting assembly (PN#700-3857) between the EBV Common Port and the line to the Evacuation Pump input.

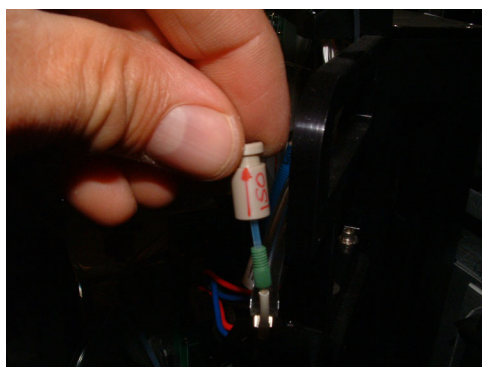


9. Preventive Maintenance

3. Replace the Tubing fitting assembly (PN#700-3859) between the DRV valve and the Flow Cell de-bubble port.

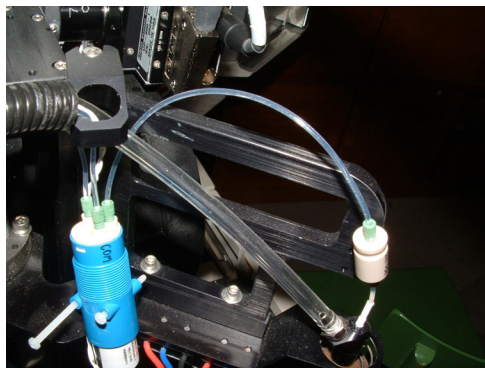


4. ***Replace the Specimen filter (PN#700-3891), the arrow points away from the pipettor. (Only for Annual Certification procedure).***

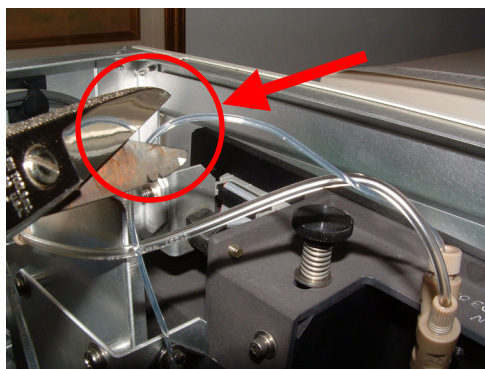


9. Preventive Maintenance

5. Replace the Tubing fitting assembly (PN#700-3895) between the Specimen Filter and the PBV N.C. Port.



6. Replace the Tubing fitting assembly (PN#700-3807) between the PBV Common Port and the Flow Cell cannula input.
 - a. Cut the old tube from the top of the flow cell and remove this tube by pulling firmly from underneath the fluid in tube detector. Remove the other portion by unscrewing it off the top of the Flow Cell, use caution not to damage the Flow Cell!

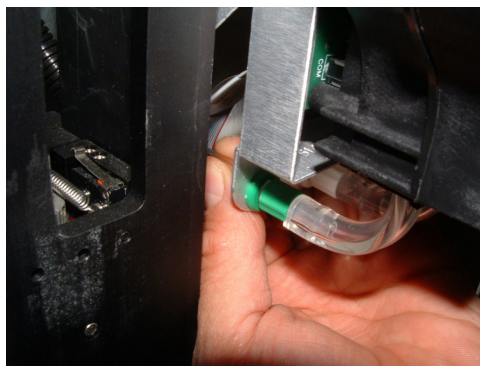


9. Preventive Maintenance

- b. Insert the replacement tube from the top of the fluid detector and connect to the flow cell.



- c. Install the new green Tiny-Tight fitting; follow procedure P-09-0046 "Instructions for Mounting Lite Touch Tiny Tight Fittings onto Tubing" enclosed with the fitting.
 - d. Connect the green fitting to the PBV valve COM Port.
7. Replace the Tubing Assembly (PN#700-3806) from the Waste Well Yellow connector to the Evacuation Pump.



9. Preventive Maintenance

Adjustment verifications

The following alignment procedures are performed from the service application software.

All adjustment procedures are described in chapter 4 of the service manual.

Sampler calibration

From the iQ[®]200 service software verify the rack position adjustment in front of the tube detector, record the correct calibration value of **cal [0] “Delta position from Home to Tube”**.

Tube detector verification

1. Verify, and adjust if necessary, the threshold value of the tube detector and record the value of **cal [8] “tube Detector Threshold Adjust”**.

Barcode scanner alignment verification

1. Use the Barcode Utility Software and verify the scanner alignment. Adjust if necessary.



9. Preventive Maintenance

SPA alignment verification

Verify correct pipette position at the waste well, test tube and test tube depth. Refer to Chapter 4 Adjustments for the correct procedure.

Fluidic system inspection

1. Run a CONTROL rack with Iris System Cleanser in position 1 and Iris Diluent in positions 2 and 3.
2. Run this rack three times to assure the entire fluidic system is primed with no air bubbles in any lines.
3. Check all fluidic lines and fittings to verify the absence of leaks.

Optical Bench Verification

1. Enter Service Application Software.
2. Verify the optic positions under VIEW>VIDEO.
3. Use Runfile Analyzer to verify the Flow Cell Tilt. The procedures of adjusting the optical components are described in Chapter 4.
4. Verify, and adjust if necessary, the optical system collimation.
5. Verify, and adjust if necessary, the Flow Cell lateral position.
6. Verify, and adjust if necessary, the Flow Cell tilt.



9. Preventive Maintenance

Auto-Focus run

1. Perform an Auto-Focus by placing a tube of Focus Solution in the Control rack in position 5. Verify Auto-Focus completes successfully.

Performance verification

Calibration run

Run Calibration and verify REF value is between 1.4 – 2.7

Control run

Run 10 Positive/Negative Controls, verify the Positive Control runs are within range with a CV of <5% using Runfile Analyzer.

Reporting

Report all the results on the PM check list form and send the form to your regional service contact at Iris Diagnostics.

